MOTOR AGE

Vol. XXXII
No. 3

CHICAGO, JULY 19, 1917

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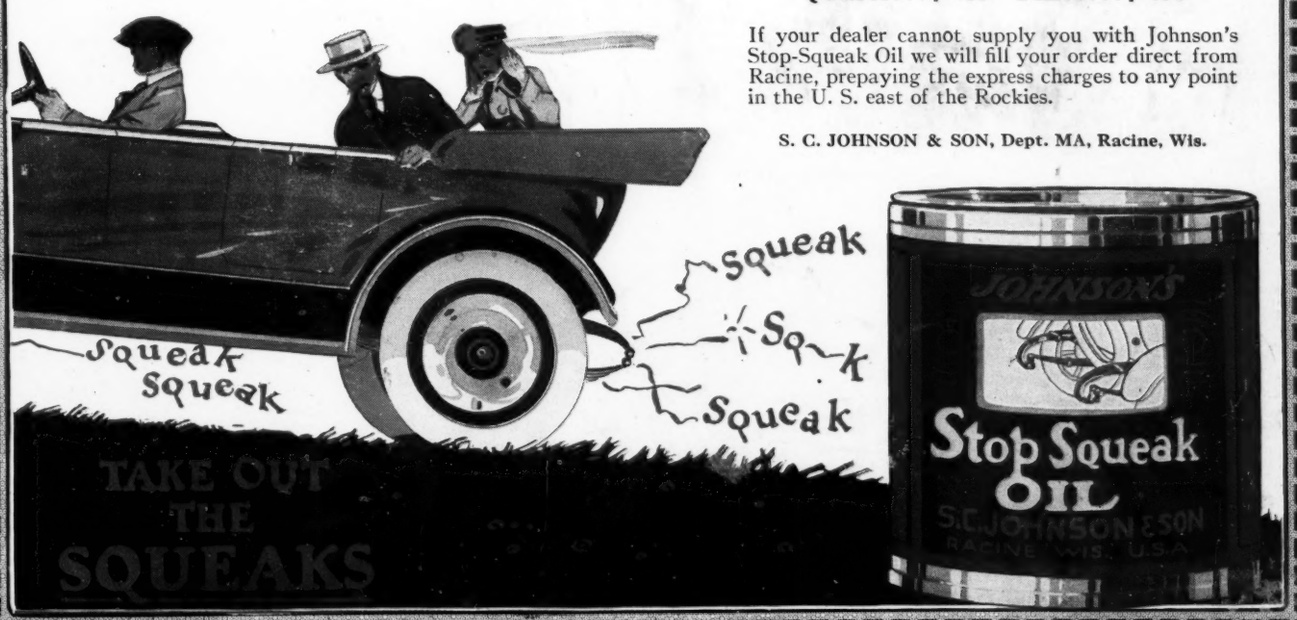

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In This Issue—How Motor Trucks Saved Verdun

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"—Words cannot express our appreciation of the faithfulness shown by the *Van Sicklen Speedmeter* in guiding us over all highways, mountain passes filled with snow, desert trails and rain-swept country ***"

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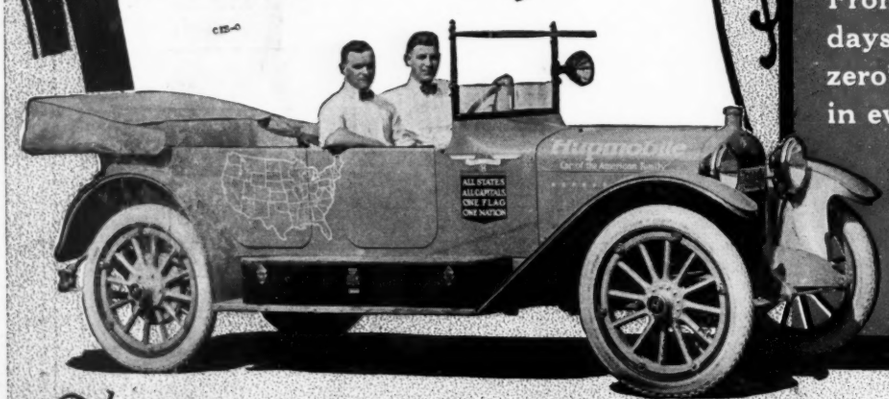

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MOTOR AGE

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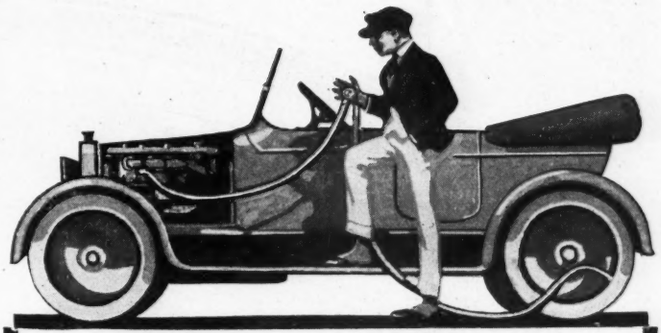
NEXT WEEK

"At Home in Our National Parks," which will be featured in the next issue of MOTOR AGE, will tell why we should visit these playgrounds and what to see when we do visit them.



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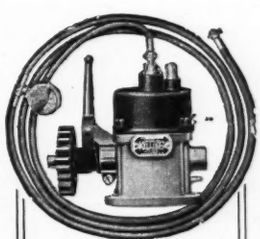

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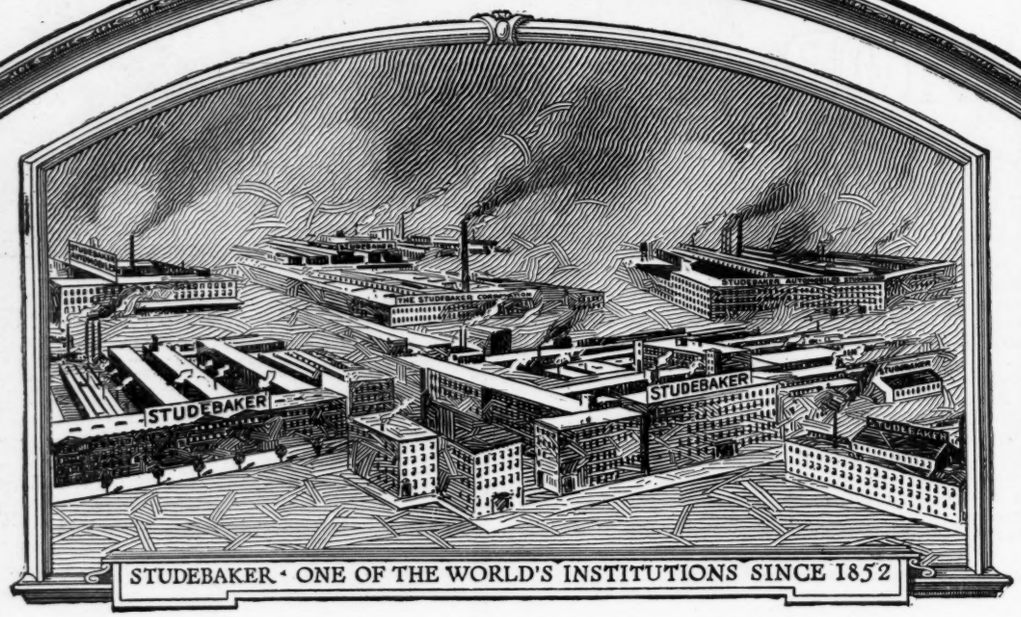

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MOTOR AGE

Convoy of Pierce-Arrow trucks bringing troops back from the front-line trenches

Such scenes as these are very familiar in the vicinity of French battlefields after attacks

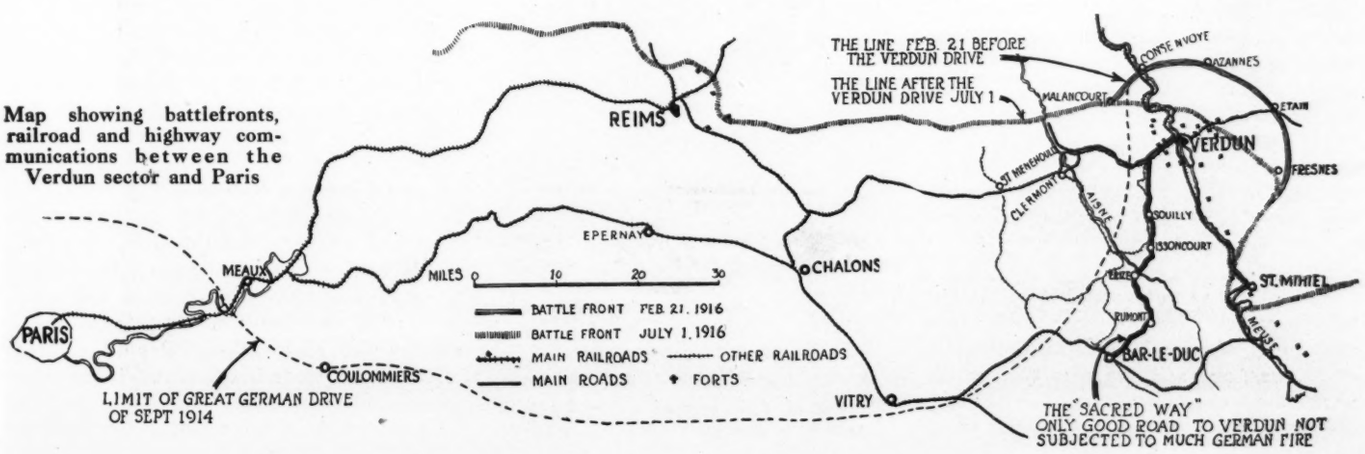
How Motor Trucks Saved Verdun

by W. F. Bradley

WITHOUT motor cars Verdun would have fallen to Germany. This is not a figure of speech, but a fact patent to all acquainted with military events and the role of the motor service during the last two or three years. One important transport authority maintains that the Germans were defeated on the Marne owing to the breakdown of their transport, first their railroads being unequal to the task, and second the road transport failing under the extra strain imposed on it. Whether this is so or not cannot be fully proved, for the full facts are held by the enemy only.

Here is an article which has all the absorbing interest of a Jules Verne tale, but with the feature that every statement is true. W. F. Bradley, the author, is MOTOR AGE'S war correspondent with the European armies and his articles are the results of first hand knowledge. This story has been passed by the Automobile censor of the French Army.—Editor.

But what happened at Verdun in the early days of 1916 is not now a secret. When the crown prince began to put in his rapid, sledge-hammer blows in February, 1916, his first thought was to harass and, if possible, cut off French supplies from the rear to the ring of forts north of Verdun. Even a slight acquaintance with the war map of Europe shows that no better point could have been selected for a German attack. Just to the east of Verdun the enemy lines formed—and still form—a deep V into French territory, so that while the German lines were just a few miles to the north of the city, the most advanced German point was twenty miles to the rear of the city, in a south-



Map showing battlefronts, railroad and highway communications between the Verdun sector and Paris

Pierce-Arrow trucks relieving troops in the Verdun sector

easterly direction. This gave the enemy the advantage of being able to shell the lines of communication a very long way to the rear of the Verdun front and it also constituted a menace of a huge enveloping movement, with the German armies sweeping right into the Champagne plains. As fort after fort fell in that long drawn out battle of early 1916, and the German army moved nearer and nearer to Verdun, until the possibility of the fall of the city began to be hinted at, not a person in France failed to realize the portentous nature of the struggle. A breach at this point and the open road to Paris might again have faced the kaiser's troops.

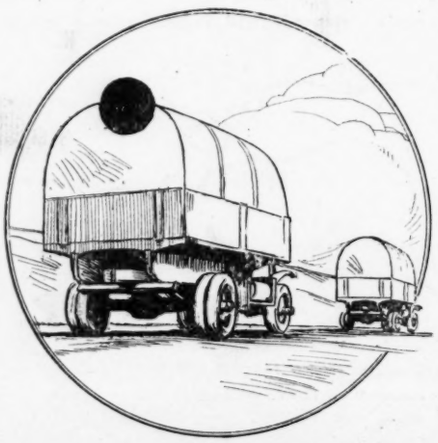
Deprived of Railroad Use

At the outset of this gigantic struggle, the French staff found itself deprived to a very great extent of the use of railroads. Thirty-four miles south of Verdun is the town of Bar-le-Duc, served by the main railroad line from Paris to Nancy, and with good means of communication with all the interior of France. But although directly in the rear of Verdun, the point of that German V projecting into France brought Bar-le-Duc within twenty miles of the enemy, and it made it the most advanced railroad depot which could be used to any great extent for supporting the troops operating just to the north of Verdun. Speaking generally, there was a zone thirty-four and three-quarter miles deep, in which no railroad could operate, and that particular zone was the center of the most desperate and prodigal attacks ever known in the history of the world.

If Verdun was to be saved it could only be accomplished by the use of motor cars and trucks, on a scale hitherto undreamed of in warfare, and by a service which would more than compensate for the loss of the railroad. The nature of the front made it impossible for there to be any converging lines, for starting from Bar-le-Duc, the roads to Verdun ran for more than half their distance parallel to the German lines, and were consequently under German fire. To make matters worse, this particular portion of France was less liberally supplied with roads than the average, so that when the motor service was informed that it would have to be relied on almost exclusively to take up the thousands of tons of ammunition required for the Verdun forts, to transport reserve troops, to keep the army supplied with food and other supplies, to evacuate the wounded, the officers of that service had to face the fact that they had only one good road available, and it was classed as a "Chemin de Grande Communication" or third class road, not wide enough for three vehicles abreast.

To obtain maximum efficiency from this road it was closed to all but motor traffic. No horse vehicle, no cavalry, no troops afoot were allowed to travel on that all-important thirty-four mile stretch of road from Bar-le-Duc to Verdun. The lack of an alternative route made it impossible to establish one-way traffic. The road was divided into six sections, each one in charge of a responsible traffic officer, assisted by an adjutant, having at their disposal three touring cars, two light cars, three motorcycles, together with their drivers, and also nine non-commissioned officers and drivers, and a number of guardsmen, or military police.

American trucks loading up with fresh troops for Verdun front



Type of disk carried by every fifth vehicle to designate breaks in sections

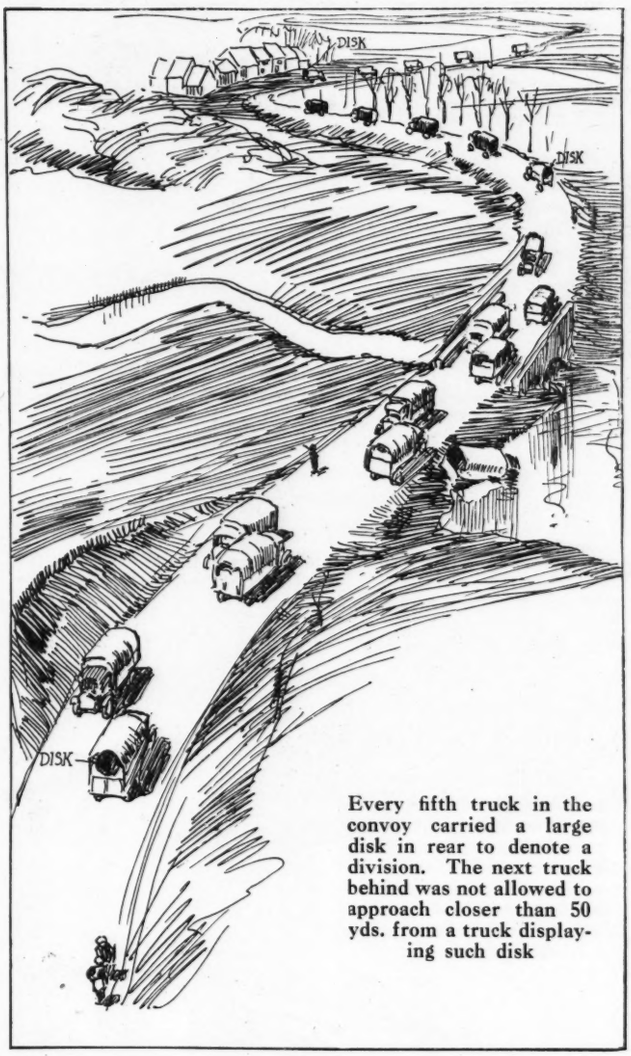
The general instructions were brief and vigorous. All motor traffic had to travel in sections of five vehicles, the last one of each section carrying at the rear a big red disk, emerging above the top of the body. While the regulation distance between trucks was ten to fifteen yards, and on no account were sections to be broken up, it was forbidden to approach within fifty yards of a red disk. If, for any reason whatsoever, it became necessary for the traffic police to hold up the vehicles, they only did so between two sections.

No Obstruction Tolerated

No obstruction of this thirty-four mile stream of traffic was tolerated. If a vehicle stopped it had to get off the road at once. The traffic police were responsible for the carrying out of this rule, and as they were all practical motor drivers, they were able to decide whether circumstances justified the crew of the truck occupying a few yards of the roadway for the neces-

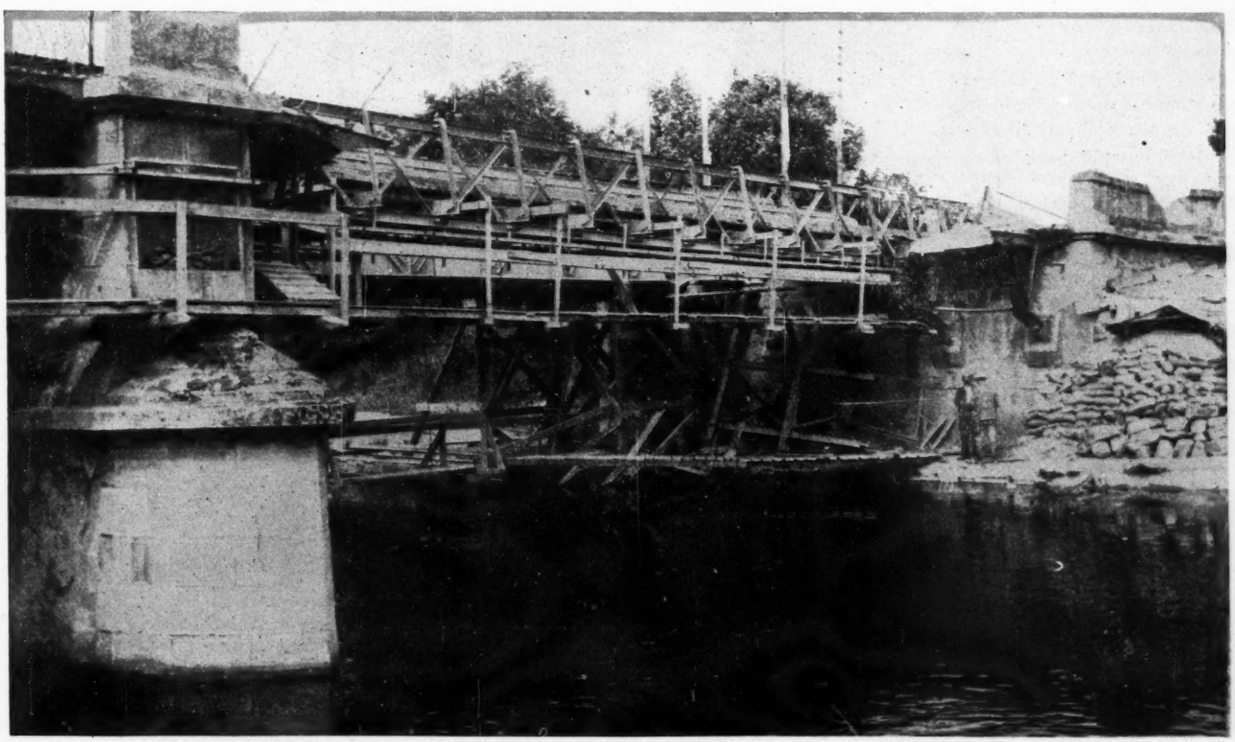
sary repair, or whether the vehicle should be run into the ditch without loss of time. Discretion, of course, had to be observed, and as the volume of traffic varied at different hours of the day and night, it was sometimes possible to allow the driver to carry out a repair, while at other times the truck had to be levered right off the road, even if five minutes' time would have been sufficient to get it under way again. Field telephones worked along the whole length of the road, and on a truck breaking down the message was carried back to the depot at which it was attached and help would be sent out. The break-down gangs were subjected to the same general rules against obstruction. Thus, when they decided to tow a truck home they had to select byways, dirt roads, or cross-country tracks instead of the main highway.

In some cases broken down trucks had to be got off the road with no other consideration than the saving of time, in consequence of which they were pushed or levered into the ditch and turned over completely, or partly. At intervals of a few days, and when the military situation admitted, the road was closed to all traffic for two or three hours and the breakdown gangs sent out with all necessary tackle to bring in the wrecks. In these cases they could occupy a portion of the road and erect whatever tackle was required to lift a heavy vehicle out of the ditch onto the road.



Every fifth truck in the convoy carried a large disk in rear to denote a division. The next truck behind was not allowed to approach closer than 50 yds. from a truck displaying such disk

With trucks divided into sections of five, no stoppages provided for, and a uniform speed of nine and one-half miles an hour, there was never any necessaity for one truck to overtake another. This road was used, however, not only by trucks, but by officers' touring cars, ambulances and telegraphic cars, which generally operated singly. It was for the benefit of these, the speed of which had not to exceed twenty miles an hour, that the section system of five trucks and fifty-yard gaps was adopted. It was up to the drivers of these cars to rush a section of five trucks, and thus gain a place, whenever an opportunity presented itself. The road was not wide enough for two trucks and a touring car to run abreast, thus no touring car or ambulance driver had to attempt to move up a section unless he saw that he could pass the five trucks before meeting an oncoming section. Under maximum traffic conditions overtaking was not possible, for as each section would occupy a minimum of eighty yards, with only fifty yards interval between them, the sections in the two streams would always overlap. It was only occasionally, however, that the line was unbroken, and any driver



One of the bridges over the river Meuse in a suburb of Verdun. This carried many detachments of troops

Typical dugouts in the Verdun district

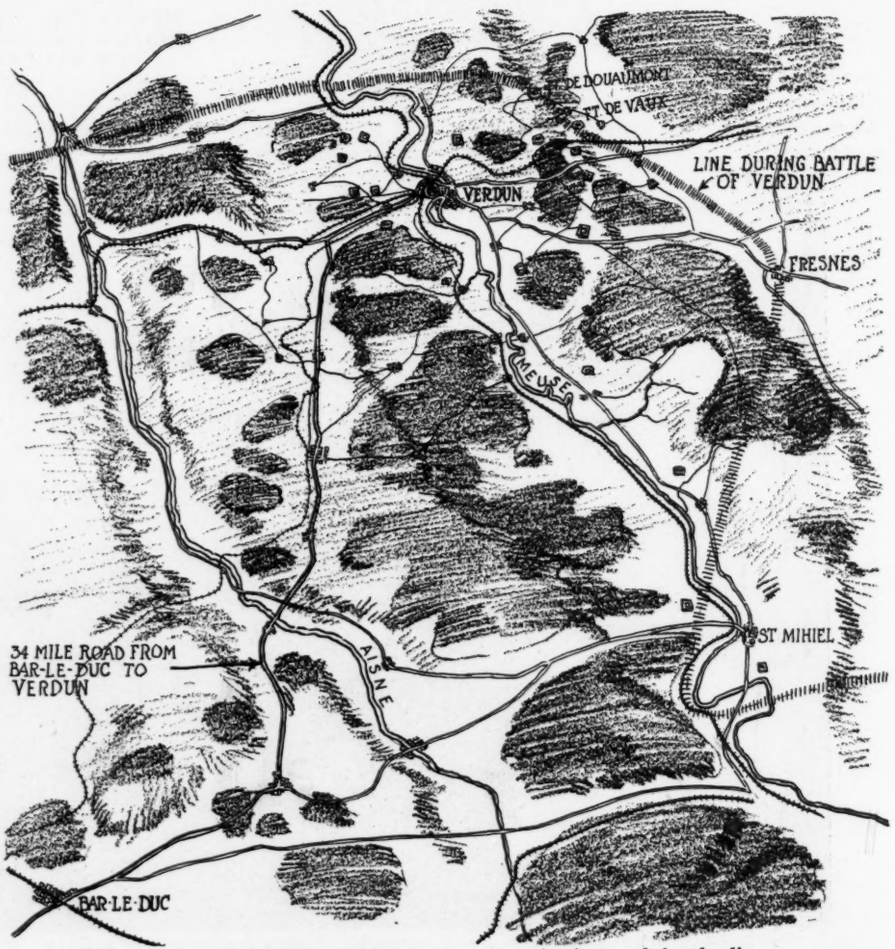
who moved to the left in order to get ahead of the slower traffic knew that at regular intervals of eighty yards he would find a safety gap if a stream of traffic was observed to be approaching.

This system was a marvel of organization which will always be to the credit of the motor service of the French army. At times there were * * * * trucks on that main road—the Sacred Way—they called it—to Verdun. There passed through the once sleepy town of Bar-le-Duc an average of * * * * trucks per day. In this district could be seen the remarkable sight of * * * * White trucks on the road together, every twenty-fifth truck being a kitchen and every fiftieth a workshop. On one occasion during the struggle, an entire army corps of * * * men was moved up to Verdun within a period of ten hours.

Struggle for Five Months

For a period of five months the desperate struggle went on, the German artillery pounding every inch of the territory and the general staff ordering division after division to be thrown in, in a determined, reckless resolve to break down the French resistance at all costs. And during that time the French troops relied on the motor service exclusively for bringing up reserves, taking away the remnants of battalions, for supplying the artillery, for bringing up food and water, for removing the wounded. The army was served perfectly; there was never a hitch,

* * *—Censored by Automobile Service, French Army.



Birdseye view of Verdun section and communication and battle lines

never a delay, never a call for more reserves which was not met by the motor service until the time when the attack was broken and the stubborn French army had driven the Crown Prince's forces out of most of the positions he had been able to secure at overwhelming cost.

Naturally the motor service was not confined to the Bar-le-Duc-Verdun road, although it was here that the greatest activity was displayed and motor vehicles triumphed over all other forms of locomotion. The whole of the region occupied by the Second Army, the one chiefly involved by the attacks on Verdun, was divided into two main sections, and each section was in command of a general traffic director invested with full powers from the general in command of the army. The traffic director was responsible for road policing, traffic in villages and at cross roads, the erection of direction posts, the creation of one-way circuits wherever necessary, the building of bridges, the placing of artillery, and engineer's parks, the necessary precautions to be taken when roads were under fire, the control and efficiency of the narrow gauge light railroad.

Right up to, through and beyond Verdun, one-way routes were established in the great majority of cases. In a few cases only was it possible to restrict the use of roads to motor vehicles; in other cases horses and motors had to make use of the same road, still under the section system of five trucks and eight-horse vehicles, while cavalry and foot were kept off. Certain roads, leading to important batteries, were closed to all but trucks taking ammunition to those batteries. In other cases, where the road surfaces were very poor, only four-wheel drive artillery ammunition tractors were allowed, conventional trucks being kept off.

Placing Ammunition Supplies

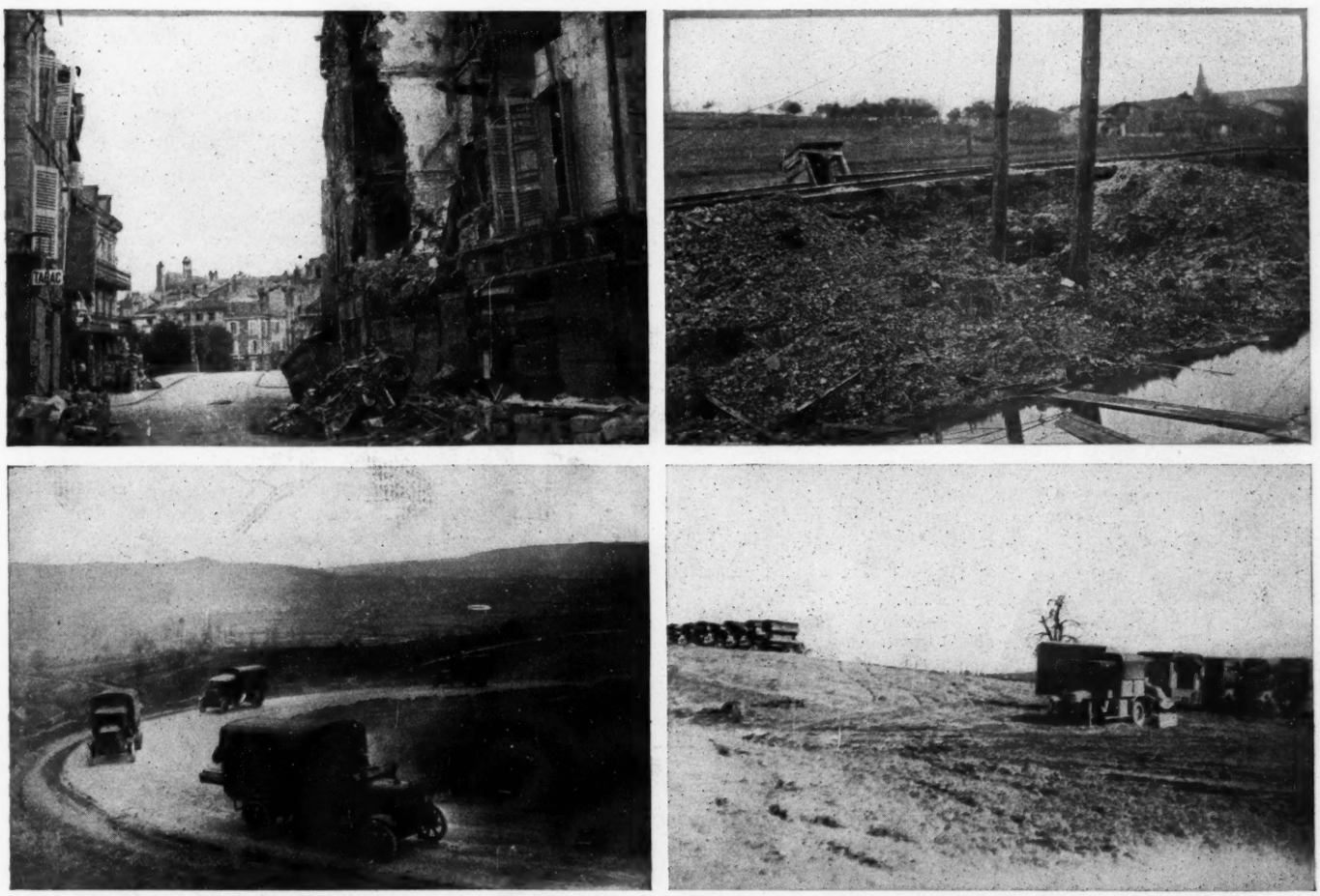
Supply trucks carried ammunition either direct to the batteries or to dumps at convenient positions somewhere in the rear, from which place it would be taken up in smaller quantities by horse or by hand, according to circumstances. Every condition was provided for by the General Traffic Inspector. Certain roads were closed to everything and everybody during daylight hours. To appear on these roads meant instant death; thus, so long as daylight lasted they were deserted, and the enemy could only guess what use, if any, was made of them after nightfall.

In the next category were roads forbidden to all vehicles, only small groups of men afoot being allowed to travel over them. In section 3 were roads closed to all vehicles except touring staff cars and ambulances, which of course ran over them singly and not in groups. These roads were essentially dangerous, for most of them were not only under artillery but subjected to rifle and machine gun fire.

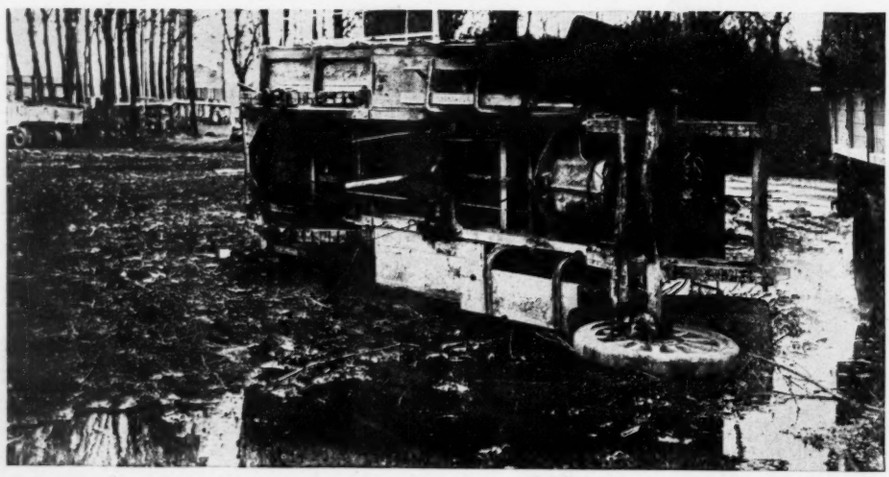
When a driver ventured on such a road he knew that he would be fired at, and his only hope lay in being able just to slip through between the shells. Whether he was bringing back wounded, carrying officers, or transporting telegraphic material and telegraphers—these being the three types of cars going to the nearest front—his chances were about the same.

One ambulance section of twenty cars and forty drivers, which went through the most bitter portion of this Verdun struggle lost ten of its vehicles and had twenty of its men killed. At an early stage one of the ambulances carrying six wounded men was hit by a shell and every man aboard was killed. For several weeks the wrecked ambulance and the mangled remains of its occupants remained by the road side and were occasionally fired at by the enemy. Day after day the others went by that tragic spot, unable to stop for a second; one after another they fell, but the motor ambulances never once failed to go up for the wounded when the call came.

When the fate of the city of Verdun



Upper left—One of the many shelled portions of Verdun. Upper right—French railroad near Verdun destroyed by German bombardment. Lower left—On the road to Verdun; trucks operating in units of five. Lower right—It was absolutely forbidden to park on the roadside. Trucks had to form up in open country as shown here



In the illustration at the top is shown the "Sacred Way" to Verdun. The route gained this sobriquet because it meant so much to France. Keeping it open meant victory. Closed, it would have spelled defeat. It was kept open and the world knows the result. In the center is a wrecked and abandoned touring car on the road to Verdun. Below is shown how wrecked trucks were put off the road during the great attack on Verdun. The road had to be kept clear for the movement of troops and supplies, no matter what the cost

hung in the balance, orders were given for the entire civilian population to be evacuated. This was additional work for the motor service, for the railroad had long ceased to run to the battered city. After the removal of the civilians, and while the town was under heavy shell fire, arrangements were made for saving as much of the household furniture as possible—additional work for the motor service.

Gangs of soldiers who had experience in moving were kept in the town and packed the houshold goods. At night motor trucks moved up to the appointed places, where they found the goods ready to be loaded, and a short time later they moved away to some town in the rear, or to a railroad depot from which the goods would be shipped to their owners. In this way, thousands of dollars' worth of valuable furniture was saved which would otherwise have been totally destroyed under the enemy bombardment.

This intense motor road service had to be carried out during the most unfavorable months of the year—January, February, March, April—when roads are generally in the least satisfactory condition. There were available for use into Verdun one third-class road—reserved for motor traffic—one national highway, or first-class road, and a certain number of minor roads not much better than the average American dirt road. The two main roads, which had to carry the great bulk of the traffic, were under frequent shell fire, the extreme portions of them being untenable.

Repairs a Serious Problem

This brought up serious problems of repair, for while the first-class road was overloaded several hundred per cent, the third-class highway carried an amount of traffic it was never dreamed possible it could support. The only method of keeping it in repair was to have road repair men at intervals of every twenty yards, with instructions to dump material into the holes as quickly as they were formed. The only rolling that was possible was done by the vehicles as they passed up and down the road. Where shell holes were formed, the same general system of repair was adopted, the wreckage from buildings frequently being employed to fill up.

While keeping the surface in the best possible condition under the circumstances, the road repair men widened the road wherever it was possible to do so. Wherever a grass bank existed it was unturfed, covered with stones, rolled and added to the main road. Wherever possible, too, bridges were widened to the full width of the road, so that there would be no bottling of traffic. This rough and ready method of repair proved very satisfactory, the roads remaining in good condition throughout the operations and never being directly responsible for the breakdown of trucks or the delay of convoys.

One of the traffic rules forbade the use of chains on driving wheels of trucks using the main road. Traffic police had definite

People abandoned their household furniture on the streets of battle-swept Verdun

instructions to stop the driver of any truck using chains and order their removal. As every truck bore clear identification marks, there was an obvious remedy against drivers who sought to evade the general regulations.

Apart from losses due to direct shell fire —which losses are variable and difficult to estimate—the percentage of trucks under repair during such active service as the great German attacks on Verdun is about 10 per cent. The same percentage holds good for ambulances. This includes repairs which can be done by the traveling workshops attached to the convoys, as well as the bigger breakdowns and overhauls which can only be treated by the permanent repair bases. Although on the motor road, trucks were subdivided into sections of five, the real unit was twenty trucks, one of which towed a kitchen, and another carried spare parts and tools. One complete motor workshop was attached to four or five groups of twenty each.

It is difficult to estimate the percentage of repairs in touring car work, for these vehicles generally operate singly. The loss, however, is less than for trucks, which may be explained by the fact that generally the drivers are more experienced, and that the greater silence of a touring car makes it possible to detect a defect before it has developed to a dangerous degree. The general volume of sound arising from a loaded truck makes it difficult for any ordinary driver to detect a warning noise.

WONDERFUL ACTION PHOTO TAKEN FROM AIRPLANE—Verdun bombarded with incendiary shells. The fires set by the shells has a portion of the town on fire and the blaze and smoke fill the air. Note parts of roads mentioned in story

World Traffic by Air After the War

British Authority Visualizes Levels of Traffic Above the Earth, with Necessary Regulations

WHAT the present application of the greatest engineering minds in the world to airplane development may mean in bringing about greatly extended use of heavier-than-air machines after the war for pleasure and commercial advantage is problematical, but Lord Montague's expression brings to mind something which few of us can conceive at present. Jules Verne's "Twenty Thousand Leagues Under the Sea" and "Around the World in Eighty Days" were looked upon as flights of fancy not so very many years ago, but today we have the submarine, and eighty days are sufficient to circle the globe not once but twice. Who knows the airplane's future.

LONDON, July 7—World traffic by air after the war and a great expansion of the airplane industry is predicted in an address delivered recently by Lord Montague. In the speaker's opinion there will be such a development of air travel at the close of the war that it is time already to consider how routes shall be defined and kept and how the best use may be made of the present knowledge of the air currents of the world.

Lord Montague foreshadowed the day when travelers from England will save eleven days in the journey to India and twenty-three to Australia, when airplanes will cover a regular average of 1200 miles per day, and when traffic will be regulated in a series of air levels of 2000 ft. each, private planes up to 2000 ft., commercial planes in the next level, "ordinary flying" together with fast commercial machines in the next, then the official planes of each nation, from 6000 to 10,000 ft., including those of the air police who will dive down on offenders in the lower depths, and finally the levels about 10,000 ft., which would be used for international travel.

Postal Service Use

There are many signs that after the war an effort will be made by all civilized nations to develop a regular postal and commercial communication by means of the air. The British Empire is in a peculiarly favorable position for the development of imperial aviation, according to Montague, for its widely separated possessions would enable its air traffic round the world, over land and sea, to proceed without asking for concession from other nations. There is a chain of imperial landing places southward and eastward from Gibraltar, about 900 miles from London as the plane flies, toward the Cape, to Egypt, India and the Australasian Dominions. The nearest points between the North American continent and Europe, the west coast of Ireland and the east coast of Newfoundland are also both within the Empire.

For some time to come flying would be more easy over land than over sea, states Lord Montague, owing to the existence of well organized landing places at fairly close intervals. As regards oversea flying, it is unlikely that straight line routes between place and place would be ordinarily adopted. Allowance will have to be made for air currents and their direction, and the study of these is going to be of supreme importance.

An airplane flying the 1800 miles between St. John's, N. F., and County Kerry at 80 m.p.h. and with a 30-mile wind would do the journey in about 16½ hr.

The land routes would probably be the first to be organized. Passenger services over long distances would only be conducted by day, but mails would probably proceed continuously. On the assumption that the stage-by-stage system, as against continuous flying, would be adopted for passenger service, time tables for two routes to India and beyond, from Peshawar and Karachi, respectively, to and from London, were given by Lord Montague in his address.

Lord Montague said that he would limit the claim to the privacy of the air above property to 2000 ft.; above that private level would be a commercial level, from 2000 to 4000 ft.; the zone would be used only by vehicles with silenced engines and with a maximum speed of 80 m.p.h. The next level would be between 4000 and 6000 ft. for planes also silenced, but with a speed varying from 80 to 120 m.p.h. This level would be for general air traffic for ordinary flying and also for fast commercial traffic. From 6000 to 10,000 ft. the level would be reserved for the official planes of each nation.

These levels would be used by the naval, military, and civil forces, and by police planes, for air police would be needed in the same way that policing of routes by land and sea is now necessary. Specially authorized pilots, and perhaps postal services, would also use the 6000 to 10,000 ft. levels, where the international levels would begin. Levels above 10,000 ft. would be internationalized.

In defining the routes chosen over continents the long and proved experience of the sea could be followed. On the right hand, or starboard side of all routes from the west to east, the direction in which the earth turns, there should be round marks—a white ring, containing a black center, while on the left, or port, side would be checker marks, square in shape. At sea a system of large buoys might be necessary.

At night routes should be defined by a continuous white light on the right, or starboard side, and red and white alternating lights on the left, or port side.

Aircraft would be identifiable by the use of the nationally arranged colors of each country for those planes engaged in official service. Private planes should be white, and commercial planes red. All planes, official or private, would be numbered and lettered after the system arranged for international motor car touring.

NAVAL AIRPLANE FACTORY

Washington, July 14—Congress will be asked by Secretary of the Navy Daniels to appropriate $1,000,000 for a naval airplane factory. An Italian airplane will arrive at an American port in the next few days with engine patterns, specifications, etc. It probably will be used by the American navy as a model of construction.

SHAW GETS PARMELEE TAXIS

Chicago, July 16—The Waldon W. Shaw Livery Co. has taken over the taxicab system of the Parmelee Transfer Co., which has dominated the railway station taxicab business in Chicago for a number of years. Shaw stations are now maintained at all railway stations and the Parmelee cabs have been retired. In place of these there have been installed 200 additional yellow cabs and fifty Shaw cars. With the installation of new equipment, the Shaw company has 800 taxicabs in operation. The rates will remain unchanged, although there is a difference between Yellow Cab and regular Shaw rates. It is explained that the Parmelee cabs will be retired for the reason that the Shaw company wishes to keep its equipment standard. Charles McCulloch continues as manager of the Parmelee Transfer Co., but with the merger of the taxicab service, he becomes a director of the Shaw and Yellow Cab companies.

Aircraft Bill Secretive

House Passes Measure and Senate Probably Will Concur This Week

Only Known in General Way How Vast Sum Will Be Spent

WASHINGTON, D. C., July 16—The importance which members of Congress, as well as the executives of the government, attach to the need for a great aircraft fleet with which to wage war on Germany was indicated by the unanimous action of the House of Representatives in voting to appropriate $640,000,000 for this purpose, an unprecedented sum as far as individual appropriations go, the House action following unanimous action on the measure by the military affairs committee of that body.

That the Senate will act promptly and favorably upon this bill is assured. All the more significant is the action of the House, and will be the expected action of the Senate, when it is taken into consideration that this vast sum is authorized to be expended practically without revealing, except in a general way, how the money is to be spent. This is an innovation on the part of Congress.

Congress knows only that approximately 75,000 officers, trainers, student fliers, and enlisted men are to be recruited, and that probably 50,000 airplanes are to be built by the War Department. The reason for the War Department declining to make public details as to plans for the aircraft army is, of course, that the Department is anxious no information which would be valuable to the enemy shall get out through any kind of spy activity.

The personnel system of the bill, which is most important, provides that the President may raise and maintain "by voluntary enlistment or by draft such numbers of enlisted men as he may deem necessary, and embody them into organizations." No man under 21 years of age can be drafted into the aerial service, according to the bill.

It is expected that from 3500 to 5000 airplanes can be built in the first six months, and 10,000 in the first year. The standardized American engine is now ready, and tests are to be made at once, that work on the manufacture of it in sufficient quantities to meet the needs of the Army may be promptly turned out. This means that the capacity of the few airplane plants, as well as the motor car factories and other concerns the activities of which may be turned to the production of the planes and engines, soon will be called upon.

Howard E. Coffin, chairman of the Aircraft Production board of the Council of National Defense; Representative Julius Kahn of San Francisco, minority leader on the House military affairs committe, and others prominent here in and out of Congress, have expressed great satisfaction with the prompt and patriotic action of Congress in expressing a willingness to make the aircraft bill into law so promptly. Mr. Coffin, commenting upon the bill, said:

There is every indication that the whole country is aroused to the one supreme chance which America has to make her power felt in Europe quickly and decisively and that few persons outside official circles have realized the task which was imposed on the signal corps in drafting, almost within a few days, legislation providing for the expansion of an American air service which amounted in its proportions almost to the creation of a new service.

McCORMICK EXPORT BOARD HEAD

Washington, D. C., July 16—Vance McCormick of Harrisburg, Pa., chairman of the Democratic National Committee, and close friend of the President, is to be chairman of the Exports Council Board which will have the say as to the licensing of exports. Mr. McCormick, it is understood, has agreed to accept the position at the request of the President.

N. C. R. MAKES AIRPLANE PARTS

Dayton, Ohio, July 16—The National Cash Register Company, has received a large government order for airplane parts. It is said that by September 1 the company will employ upward of 6,000 men, both skilled and unskilled. The plant of the Domestic Engineering Co., at Moraine City, it is said, will be turned over to the local airplane company for the manufacture of machines.

Lets Army Contracts

Chief of Staff Approves Contracts Submitted by Quartermaster's Corps

Total of 10,650 Trucks Chassis to Be Supplied

WASHINGTON, D. C., July 17—(Special telegram)—The chief of staff of the army has approved contracts submitted to him by the transportation branch quartermaster's corps of the army for a total of 10,650 truck chassis as follows:

Packard Motor Car Co., 300 Class B chassis, in accordance with schedule L, and government specifications as modified by exceptions in Packard exhibit "D"; delivery to be 100 in August and 200 in September; price $2803.81 each.

Packard Company, 1500 Class "B," in accordance with schedule "N" and government specifications as modified by Packard exhibit "E"; delivery 500 per month, starting October; price $3197.37 each.

Locomobile Company, 400 Class "B" chassis with electrical equipment to government specifications as modified by manufacturer's specifications; delivery, 125 in October and 125 each month until contract is completed; price, $4224.57 each.

Four Wheel Drive Company, 3250 Class "B" chassis as per proposal No. 1, with rear bumpers and ordnance towing hooks at $48 each. Total, with bumpers and hooks, $3248; delivery, 175 in August and 175 each month until contract completed.

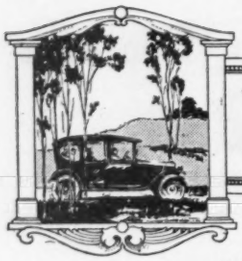
Pierce Arrow Company, 700 Class "A," in accordance with proposal No. 2; delivery in accordance with proposal, $3500 each. Order to be increased to total of 800 if agreeable to Pierce Arrow Company.

Nash Motors Company, 3000 Jeffery Quad Class "A," according to specifications as modified by bidder's proposal; delivery by July 1, 1918; price $2805 each.

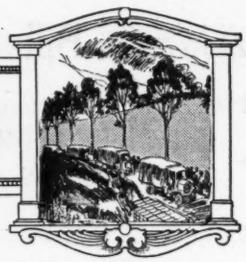
Garford Motor Truck Company, 900 Class "A," in accordance with exceptions by bidder; delivery complete by end of December, 1917; price $2730 each.

Motorcycles, 2500 Indians and 1500 Harley-Davidsons, $247 each, outside price.

An unusual sight was presented in Amarillo, Tex., when the Ozark Trail convention tented on the outskirts of the city. These two illustrations give some idea of the magnitude of attendance at the meeting



EDITORIAL PERSPECTIVES



Why Only Motor Cars?

IT is time that some definite step is taken by motorists' organizations to see that the lighting laws are inforced as regards horse vehicles in the same way that they are as applied to motor cars. Every state has a law requiring some illumination of motor vehicles between the hours of sunset and sunrise. Most of these laws are so framed that they apply to horse vehicles as well as motor vehicles. If they do not, they are open to the question of unconstitutionality from the standpoint of class legislation.

AN unlighted horse vehicle is more dangerous as an obstruction than an unlighted motor vehicle, because as a general rule it takes up more space and also because it is less quickly gotten out of the road. City and state officers rarely pay much attention to unlighted horse vehicles, and seemingly in localities where they are most stringent with regard to motor vehicle illumination, they are most lax in the inforcement of the same regulation when a driver of a horse vehicle is the offender.

MOTORISTS of New York state will find cause for rejoicing in two recent decisions of the New York court. One of these is reported by Bench and Bar, in which the Appellate court reversed the decision of a lower court which had held the driver of a motor car guilty of contributory negligence because his car struck an unlighted horse-drawn vehicle on a dark road, on the ground that the motorist was driving on the wrong side of the road. That is, the motorist in obeying the highway law, in the matter of light, is condemned for undue divergence from the right, and the driver of the horse-drawn vehicle disobeying the statutes is acquitted of all contributory fault.

THE Appellate court in reversing this finding, holds that in directing the wheels of the car to the left, as was necessary to round the turn, the range of the car lights would still be cast to the right, away from the road and the defendant would turn his eye from their influence to the darkness, whatever its degree, with the usual diminution of vision. In that shadow or darkness the statute commanded the plaintiff to have a light. It would have forewarned the defendant at a distance; it would have guided his approach; it would have localized the carriage at the turn; it would have warned the defendant at every part of maneuver of passing. So the plaintiff accuses the defendant of getting too close to the wagon, although he withheld from the defendant the very signal that would have enabled the defendant to follow the true course and keep a proper bearing. The statute was for the plaintiff's protection; it was to enable the defendant to guard against injury to himself or to the plaintiff. In the very nature of the case, the absence of the light was a contributory cause, for the statute intended that a light on the carriage should be a signal that would aid the person operating a motor vehicle to "turn the same to the right of the center of such highway so as to pass without interference," as the statute required him to do.

Alcohol and the Fuel Situation

REPORTS from Canada which were printed in MOTOR AGE this spring that an entirely satisfactory alcohol fuel has been made from sawdust, previously a waste product of the lumber industry and which can be made at a very low price, gives rise to the hope that the oft-promised alcohol production from wood waste may in time be realized in sufficient quantities to provide an alternative motor fuel. A few of us realize just how highly desirable a substitute fuel of this character would be.

AMONG the advantages of a low-priced alcohol fuel in commercial quantity, the chief one would be the conservation of our dwindling supply of fuel derived from petroleum. It would conserve it both as to quantity and quality. Also by bringing into the market a lower priced fuel, other fuels would be automatically held at a more constant level and probably would be prevented from going to excessively high prices. Third, its efficiency as a fuel in engines designed to utilize it properly, is high enough to make its use well worth while. Fourth, its cleanliness as compared with gasoline is a very great advantage as there is an entire absence of carbon deposits from alcohol.

AT a recent meeting of the American Institute of Mining Engineers, the statement was made on highest authority that the total resources of this country in petroleum were 36 per cent exhausted and that, based on past experience, the supply in sight would not last more than 25 to 50 years; but that if the motor industry should continue to increase its production at the rate it has during the last few years, the supplies in sight will not last more than 15 to 25 years. The nearer we approach the end of our resources, the poorer quality we may expect.

"Pleasure" or "Passenger" Car

THE very strong movement throughout the industry to eliminate the word "pleasure" from the motor car vocabulary is indicative of the rapidly broadening field of the motor car. The proportion of motor vehicles used solely for pleasure purposes is so small that to apply the word "pleasure" to the class of cars designed for private transportation of human beings as distinguished from vehicles designed for the transportation of merchandise no longer is proper.

TIME was when the motor vehicle was used wholly either for business purposes or for pleasure but, nowadays, a touring car or roadster most frequently is a part of the business equipment of the owner. The motor car used on the farm is not used for pleasure purposes entirely. The doctor's car used to save patient's lives is not used for pleasure purposes. The touring car or roadster used on any business errand is not a pleasure car. It has been the unfortunate selection of the word "pleasure" as a definition of a type of motor vehicle that has to some extent been responsible for adverse state and federal legislation.

UP to the present time, the word most commonly used to replace this objectional one is the word "passenger." That is the word that MOTOR AGE uses to distinguish the motor car which is privately owned and designed primarily for the transportation of human beings.

How Uncle Sam Teaches Flying

OUR government, through the services of the Signal Corps and its enterprising head, General Squier, is going ahead on an enormous scale to train an army of aviators. Those to whom the romance of the air appeals will be interested in learning what the course of training comprises. Last May, before the vast flying fields at Dayton, Champaign and Detroit were established, schools were organized at half a dozen of the larger universities to train student aviators and to teach the freshman classes by intensive methods the theory of flying and air-fighting. These are called ground schools, and it is probable that the course of training which shortly will begin at the government flying field will be somewhat similar.

STUDENTS entered upon the rolls of the ground schools are called "cadets" and, until supplied with uniforms, will wear a distinguishing band on the sleeve. These cadets have no easy time of life, by all reports; and the course of study, although fascinating in the extreme, requires quick thinking, application and accuracy. The first course, devoted to theory, lasts eight weeks. Those who can pass the examinations at the end of this time are graduated to the aviation schools where there is practical flying over a period of time varying from three to four months. Cadets are called upon to prepare for examinations in the following subjects:

Engines	Theory of Flight
Cross-country and General Flying	Aeral Observation
Signalling and Wireless	Gunnery
	Military Studies

The first subject takes the student, in the beginning, through a thorough course on the operation and construction of stationary engines and later into the intricacies of the rotary engine and the magneto theory

The theory of flight includes, quite naturally, a number of subjects, embracing the history of human flight and the physical problems involved in flying. The student is taught to distinguish between the various types of machines, to become familiar with their points, and to learn about their care and repair. The mysteries of sail-making and splicing are revealed; rigging and landing gear are explained in practical illustrations. And among the most important things to learn is the contents of that wizard's bag which has saved many an aviator's life—the tool kit.

In the study of cross-country flying the cadet is expected to take up such abstruse subjects as meteorology and astronomy—the first to "show which way the wind blows" and the second to give a familiarity with the stars which will enable the night-bound aviator to guide without compass. Everybody knows the supreme importance of photography in military flying, as practiced on the Western front. To know your camera and when to "shoot" as your machine goes zig-zagging over enemy territory is an accomplishment which the military air-man cannot do without.

All our alert American boys who will soon be flying over the German lines will find themselves a part of what has been so often called "the eyes of the army." The sharp little telescopic eye of the airplane can spy out an approach of reinforcements, locate a battery, take note of some new trick of "German deviltry" on the side of the line nearest the Rhine, and have the information flashed by wireless instantaneously back to the allied commanders. But most important of all, the airplane is now entirely depended upon as a range-finder for the big guns which bark incessantly along the front.

With those important ideas in mind the instructors in our ground schools are giving an especially thorough course in artillery observation. The study of the "miniature range" is an especially fascinating one, and a pretty good test of eye-keenness, cool-headedness and sense of direction. A miniature of the enemy country is painted on a board and the cadet sits on an elevated platform above his objective which will, as far as vision is concerned, approximate his view of the earth while flying at a fighting height. Landmarks are indicated on the chart and the instructor indicates some spot which an imaginary battery is firing upon. At whim the instructor will make spots on the board a few inches to left or right or above or below the objective of fire; and it is the job of the student to correct the aim of the hypothetical big gun.

Map-reading, too, is an item to which the student must give his prayerful attention. The most skillful

(Concluded on page 27)

Good Roads Convention 3 Miles High

The highest good roads meeting in the world's history held on top of Pike's Peak July 11

Pike's Peak Ocean-to-Ocean Highway Men Meet on Crest of Mountain for Which Road Is Named

By H. G. Hedden

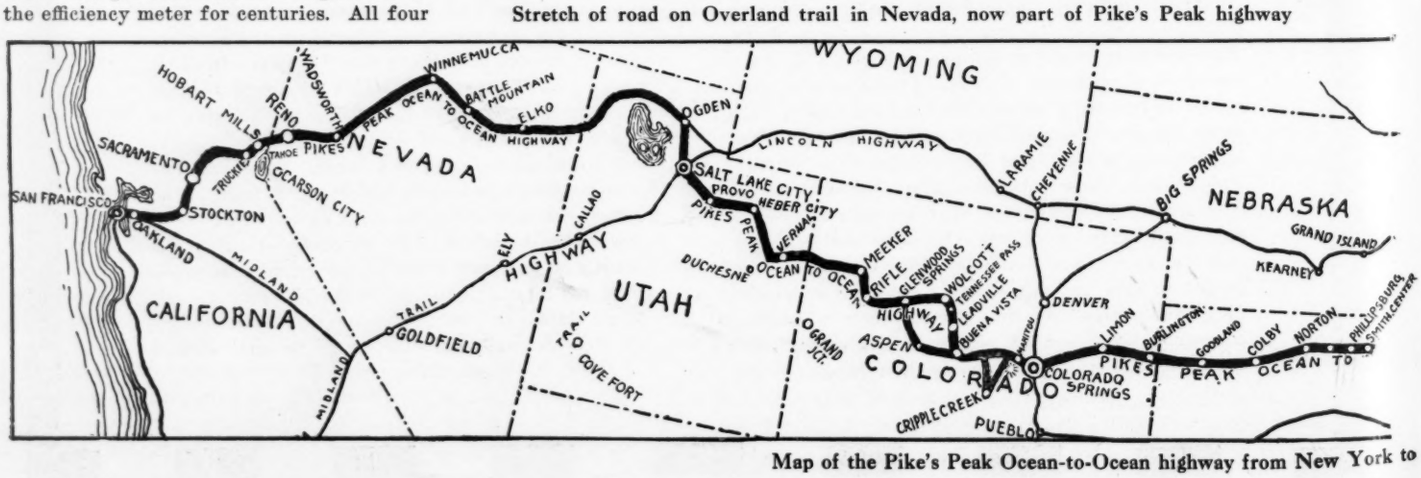
COLORADO SPRINGS, Colo., July 11—In the highest good roads meeting on record in America, if not in the world, two more states, New Jersey and Nevada, were definitely added to-day to the Pike's Peak Ocean-to-Ocean highway, when members of the association met in convention on the snowy summit of that historic sentinel of the mighty Rockies, 14,109 ft. above the level of the sea. Seventy-one and 455 miles are the respective lengths of these two new official links in this 3500-mile scenic motor road of central position across the continent. And many other things of high value were accomplished by the twenty hard-working delegates from Illinois, Missouri, Kansas, Colorado and Nevada.

The 3-mile altitude of this unique meeting place was only a start in comparison with the degree of determined enthusiasm and practical planning of the convention. And the interest shown did not effervesce away in picturesque oratory about entrancing but unattainable theories. The effervescing was left to the nearby soda springs at Manitou and the picturesqueness to Nature's scenic handiwork all about, where 100 per cent has been registered on the efficiency meter for centuries. All four sessions of the two-day meeting were marked by scant talk and abundant action. Substantial results of a wide scope were reported and others assured.

The industrial and military importance of this "Appian Way of America" was outlined by Judge J. W. Deane, of Aspen, president of the Colorado division and one of the founders of the national organization, as follows:

"The Pike's Peak Ocean-to-Ocean highway is, of all roads that can be conceived, the most important that can be made in any land in the world. It is more than a matter of boasting that the United States is an unequaled division of the world, capable of the utmost variety in almost every class of production and possessed of a wealth which can be termed almost unlimited. Through this wonderful country, and about at its middle, connecting the greatest seaport on the Atlantic with the greatest seaport on the Pacific, this highway has been laid; and its originators had in view its commercial and its military consequence as that great avenue which should be avail-

Stretch of road on Overland trail in Nevada, now part of Pike's Peak highway



Map of the Pike's Peak Ocean-to-Ocean highway from New York to

Northern slope of Pike's Peak as seen from highway near Woodland Park west of Ute Pass

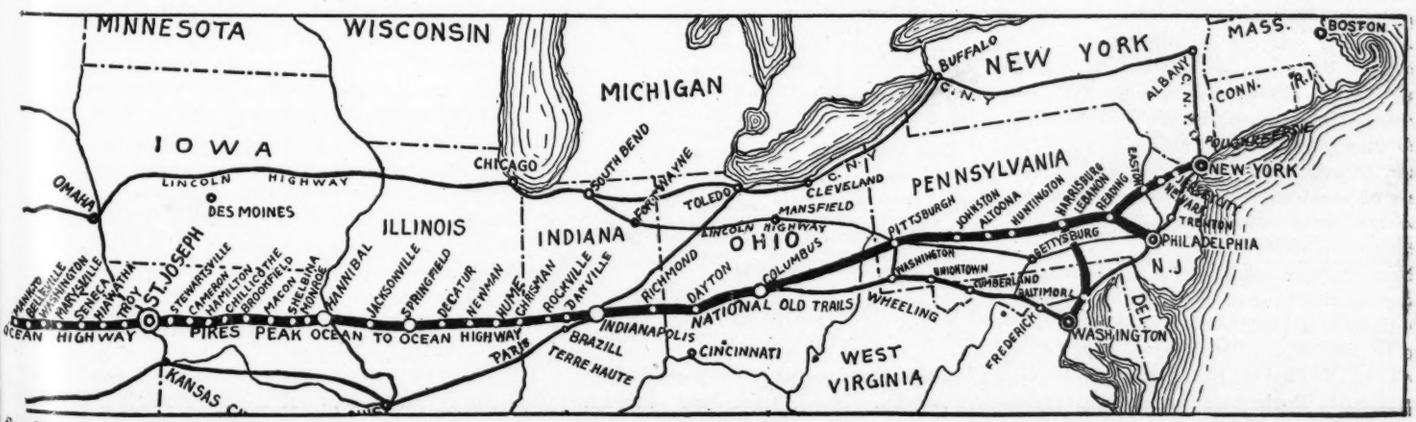
able in times of stress for at least two-thirds of the population of the United States.

"It runs through the breadbasket of the land and across that section of utmost variety in agriculture, both as to foodstuffs and textiles, and it goes through the heart of the mineral region wherein is to be found every ore capable of producing any metal which the needs of civilization and science demand. It goes through the only zone of absolute safety there is in this country. It enables the marshaling of resources from either shore to the other, or their storage within a middle section which would be beyond capture or conquest although both shores should be attacked at the same time. We have passed the period of talking good roads and are now at the stage where we must build best roads. The evident necessities are that the grades and all other construction features of this chief artery of commerce and this main thoroughfare of preparedness and defense shall be such as to afford the safest and most expeditious means for intercommunication and for transportation, and for the delivery of armies as circumstances shall require. The ultimate needs of this road are tunnels through the chief ranges which it now traverses. It is time for us to make a concerted move for Government aid, and for the recognition by the people of the entire nation of the paramount value of this particular thoroughfare."

Leonard E. Curtis, of Colorado Springs, another pioneer road builder of broad vision and the spirit of co-operative toil and sacrifice that builds nations and advances human welfare, enlarged upon the military aspect of highway and motor car development by citing such European events as the saving of France in the Battle of the Marne when General Joffre was able to load the Paris garrison into taxicabs and rush them to the front at the decisive point, and by pointing out industrial conditions in America which clearly demand an adequate system of national highways.

"Transportation is likely to constitute one of the most serious problems we shall have to face," he declared, "and it seems clear to me that road building is one of the industries which should have first place in preparedness. Next to the primary cost of production, transportation constitutes the largest element in the final cost of food and all materials and supplies that enter into the cost of living and are required for purposes of the war. Leading economists

New steel culverts along Overland trail in Nevada, new section of Pike's Peak road



San Francisco. The Nevada section was fixed at the recent meeting on Pike's Peak

tell us that the present railroad system is already inadequate for present needs. The railroads need billions of dollars for increasing their facilities, and there seems to be little hope that they will get the funds they require for a long time to come.

"Few of us have any adequate conception of the magnitude of the financial side of this problem. Some time ago I made a rather careful estimate of the requirements of our own County of El Paso. This county, by the way, is about twice as large as the state of Rhode Island. I found that to provide the county with a system of highways of the standard, say, of New Jersey or Massachusetts, would require about $5,000,000. Afterward, for the purpose of a talk I was asked to give before the Colorado Scientific Society, I made an estimate as to the requirements of the state for a similar system of highways, and found that it would be considerably more than $300,000,000. While I was making this estimate, I happened to read a paper by Mr. Stevens, the head of the highway department of New Jersey, in which he made an estimate of the cost of providing the entire country with an adequate system of highways. His estimate was $12,000,000,000, which, in proportion, coincided rather closely with my estimate in regard to the requirements in Colorado. He said that to construct this system of highways would require the labor of 400,000 men for 40 years, in work directly on the roads, without counting those engaged in making cement and other materials, tools, machinery and equipment. These are very large figures, but I do not believe they are too large, and they give us some idea of the magnitude of the problem before us. And we must face this problem as patriots and business men, and not let big expense figures stagger us. The war has already taught us to think in billions and to provide funds, when necessary, in billions.

"It is one of the principal duties of this association and similar organizations to educate the people by calling to their attention these considerations and others, and to enable them to think in billions for highway purposes as well as for war when the proper time comes."

Mr. Curtis declared that the right kind of roads would make possible a yearly saving of $7,500,000,000 in the cost of hauling the 5,000,000,000 tons of freight moved per annum over the nation's highways. He also pointed out the benefit of good roads to farm life, public health and education and human betterment in general, and urged good roads as an asset to democracy.

President C. F. Adams, of Chillicothe, Mo., Secretary A. W. Henderson, of Colorado Springs, and other delegates reported substantial improvements in construction, maintenance and marking in several sections, a $4,000 fund pledged to carry on the 1917 expenses for signboarding, publicity and other activities.

A 100-mile stretch of brick road 18 ft. wide is already assured in eastern Kansas by petitions signed for a special tax under the zone system in use there, and the same kind of road is also promised in Missouri and Illinois.

Extensive widening and surfacing is now under way in Colorado along the Pike's Peak route, while the Overland trail in Nevada, the new link, has already been

(*Continued on page* 22)

Franklin Makes 82.8 Miles to the Gallon

SYRACUSE, N. Y., July 14—One hundred and seventy-nine telegrams, directed to the Franklin factory at Syracuse, all stating how far a Franklin car traveled on a single gallon of gasoline on Friday, July 13, give a story of present-day motor-car thrift.

These telegrams gave the report of the national efficiency demonstration, conducted by Franklin dealers in practically every section of the country, and recorded a grand average of 40.3 miles on a single gallon of gasoline. Most notable among the runs was the one at New Haven, Conn., where Cowles Tolman established a new world's record for a standard car by running 82.8 miles on one gallon of gasoline. Detroit registered second, with a record of 71.6 miles; Akron, third, with 69.4 miles; and Meriden, Conn., fourth, with 69.3 miles.

Similar demonstrations of Franklin efficiency and thrift were conducted in 1914 and 1915, in which the respective national averages were 32.8 miles per gallon for ninety-four cars, and 32.1 miles for 137 cars. This year at practically all points participating in previous tests former averages were exceeded by 20 to 25 per cent.

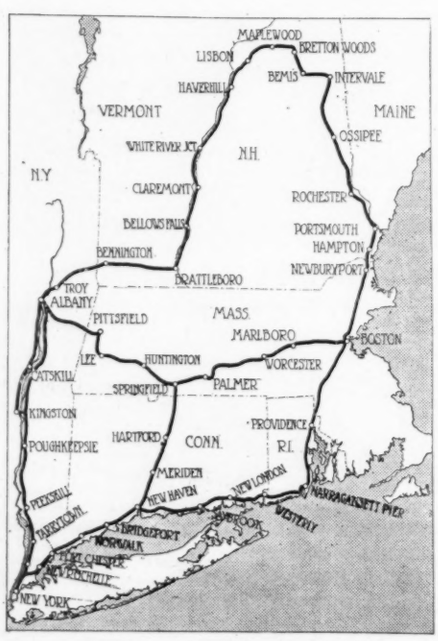
Best Roads Around New England

TOURISTS at this time of the year are flocking into the New England states. Recently MOTOR AGE pointed the best ways to reach New York from Chicago and the middle west and by referring to June 28 issue those in the middle west who contemplate eastern trips this summer will find the best roads charted as far as the Hudson river. This week we give you a series of roads through New England. These are sufficient for a tour of two weeks or longer.

Albany to Boston

Assuming you are at Albany, the best route to Boston is by way of Pittsfield, Huntington, Springfield, Palmer, Worcester and Marlboro to the Hub City. This embodies a part of the Mohawk trail and leads through the Berkshires and within view of the Green Mountains of Vermont. The last part before reaching Boston is through a historic section.

New England roads are largely macadam and good throughout the year. From Boston there is a longer route to Albany taking in the While Mountains. This goes north to Newburyport, Houghton, N. H., Portsmouth, Rochester, Ossipee, Intervale, Bretton Woods, Maplewood, Lisbon, then



Map showing roads between Boston, Albany, New York and through White Mountains

south along the Connecticut river through Haverhill, White River Junction, Claremont and Bellows Falls to Brattleboro, Vt., then west through Bennington, Vt., and Cozy to Albany. This is all good road.

The route down the Hudson from Albany to New York is good either side of the river as far as Kingston, but the road on the east side of the river is best from there on. The road on the west side is somewhat difficult in the vicinity of the Catskills.

New York to Boston

New York to Boston, the ideal route is to follow the coast line to Providence, going through New Rochelle, Port Chester, Newark and Bridgeport, New Haven, Saybrook and New London, Conn., Westerly and Narragansett Uier to Providence, thence northeast to Boston. There is another route branching off from New Haven through Meriden and Hartford to Springfield, where it connects with the Albany-Boston road. New England offers much of interest to the tourist. Here it was that our country had its origin so far as English-speaking people are concerned. The highway systems of all the New England states compare favorably with any others

How Cylinder Construction Affects Cooling

The Ideal Combustion Chambers and Practical Compromises

AN unusual and clear presentation of the problems of engine design insofar as the cooling and carburetion facilities are concerned, was presented by H. L. Horning, general manager Waukesha Motor Co., at the April meeting of the Mid-West Section, Society of Automotive Engineers, at Chicago. Horning's talk was a part of a symposium on present-day fuels, and he brought out some of the factors by which the combustion chamber affected carburetion and cooling. This was illustrated by a chart which is reproduced herewith.

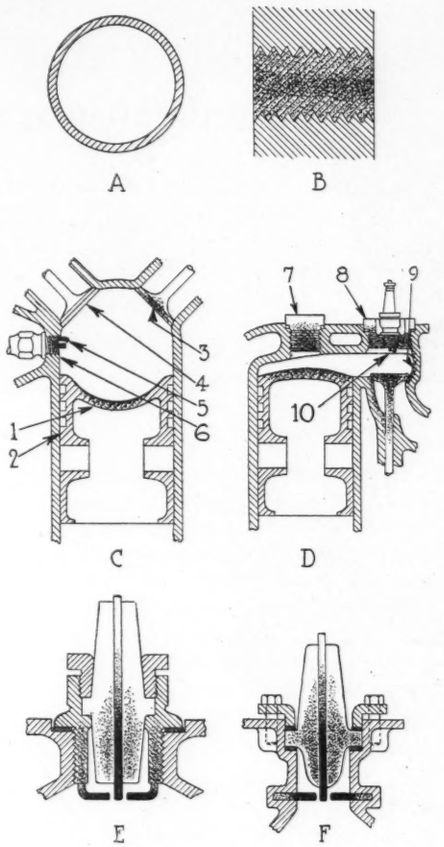
A notable fact in organic chemistry is that the more complex the substance or, in other words, the greater the atomic weight, the greater the ease with which it breaks up into compounds of simpler structure. In the higher boiling-point fuel the tendency is to crack at lower temperatures than when high-test gasoline is used, as the atomic weights get heavier and the boiling points go up. The range of explosive proportion gets smaller until finally when we reach a heavy fuel like kerosene we get to a point where we must have just one exact proportion; otherwise the motor would not run.

The limit of carbureter performance is the atomic weight of the fuel. I wish to call your attention to the fact that it was developed by Professor Fishleigh at the mid-winter meeting that in our engines, particularly for automobile service, we have only 23 per cent thermal efficiency. We have the problem of heat elimination, which is our greatest problem—to keep the combustion chamber cool enough so that it will not crack the heavier fuels and at the same time hot enough to help vaporization.

Fig. A is a section through a theoretical ideal combustion chamber. A sphere is the ideal combustion chamber, for the reason that there is perfect cooling and there is a perfect temperature gradient between the surface on the inside at the time of combustion and on the outside.

In order to develop that principle and to show the difficulties and the compromises That chamber is ideal which will dissipate the greatest amount of heat without interfering with the combustion of the fuel. Inasmuch as we have something like 45 to 50 per cent of the heat of combustion to dissipate to the water, it becomes a very severe problem to hold down the surface temperature of the combustion chamber.

In order to develop that principle and to show the difficulties and the compromises which we have constructed, a drawing of a classical experiment was shown to a class in physics in a New England institution. A piece of steel, Fig. B, 3 in. in diameter represented by the ruled section was drilled and tapped and a stud with as near a perfect thread as could be made was screwed into the hole. The end of the 3 in. piece and stud were then milled off and polished so perfectly that the joint was hardly visible to the eye. This whole piece was heated up to red temperature, and then allowed to cool. The inside glowed for a considerable period after the outside was invisible. In the ideal combustion chamber there must not be any part



Horning's chart to show where heat conduction is slow in a cylinder and how spark plug dimensions affect efficiency

which loses its heat through a film of air, oil or any other substance of low heat conductivity. It must be continuous in order to conduct the heat perfectly. The ideal combustion chamber should have no screw threads entering for the reason that screw threads will not dissipate heat.

Referring to Fig. C and remembering the principles illustrated by Figs. A and B, we have a long series of compromises which the engineer has made to produce a practical engine. It is only by elimination of some of these completely or modifying some that we can improve the output of our present engines. The most important compromises are as follows:

1—THE PISTON HEAD.

2—THE CONNECTION BETWEEN THE PISTON AND THE CYLINDER, where as we all know there is a gas film as well as an oil film.

3—THE EXHAUST VALVE TERMINAL RIDGE at the seat.

4—THE INTAKE VALVE, which is not so much so because of the cool incoming charge.

5—THE THREAD OF THE SPARK PLUG. The plug is heated very easily to a temperature so high in heavy duty motors as to give pre-ignition and breaking down the porcelains.

6—HEAVY SECTION OF METAL poorly water cooled.

7—Fig. D—CYLINDER HEAD PLUG overheated because of thread in cylinder.

8—THE VALVE CHAMBER PLUGS to the spark plug.

9—THE SURFACE NEXT THE EXHAUST, which is so close that it overheats that part of the cylinder.

The Three Dimensions Which Govern Spark-Plug Efficiency

10—Relates principally to that part or region around the EXHAUST VALVES heated unduly by the exhaust charge. The region within a valve diameter from its center dissipates a heat in many cases equal to or greater than the brake horsepower.

The ideal combustion chamber must be one in which there is a uniform temperature to the valve as high as possible to vaporize the fuel throughout the entire surface and a low maximum temperature as indicated by such spots as the middle of the piston, the middle of the exhaust valves and the spark plug points. As has been said before by many writers, the spark plugs and the exhaust valves constitute the important items that have to be considered in an engine working to the limit, such as in tractors and airplanes. In aviation engines, it is a fact that the heat is so intense and so continuous that the porcelain decomposes or changes in structure after a period of some hours. Studies have now been undertaken to improve the quality of the porcelain and correct the plug through improved design.

Efficiency of Spark Plug

Fig. E represents a typical spark plug. The cooling efficiency of a plug depends on the distance its heat has to travel and the resistance of the path. Porcelain is a non-conductor of heat as well as electricity. The main resistance therefore to the heat flow in a spark plug is the insulation and the threaded connection between the body of the plug and the cylinder.

Fig. F illustrates an ideal spark plug from the standpoint of cooling. The elimination of the body of our present plugs will be necessary before we can bring the spark plugs up to the reliability of other parts in tractor and aviation engines. Cooling of ground terminal by connection with the water jacket also seems ultimate.

Parts must be minimum in size so as to take into consideration the law that exposed parts vary as the square of a normal dimension whereas also does the heat dissipation capacity, while the heat content varies as the cubic, all of which is an instant demand for the smallest parts possible with consistent strength of parts physically and electrically.

Engine builders can aid materially by a study of cooling water flow so directed that a cool stream flows easily and is aided by the thermo-syphon flow caused by heat gathered from the spark plug region.

Water flow inside the cylinder is largely influenced by heat conditions. Pump circulation is only such in reference to the cylinder as a whole. This corresponds with our experiences and should be taken into account in designing cylinders of all types.

In defense of the present gasoline, it may be said that the question of ignition is often overlooked. This is a very delicate point and there will probably be criticism. You cannot consistently burn the present fuel or the fuel of the future with a battery system. The reason is that the battery cannot be depended on as a source of current. We must have the best spark possible, so hot, so definite and so fierce that our worry is whether we will cool ignition points. If we can get a battery that will not deteriorate, let us go on with the battery; otherwise not.

Win Only Honor and Glory at Snelling

Vail Victor in 100-Mile Dash—Rejuvenation Races Fail to Draw the Crowd Expected So Drivers Get Nothing

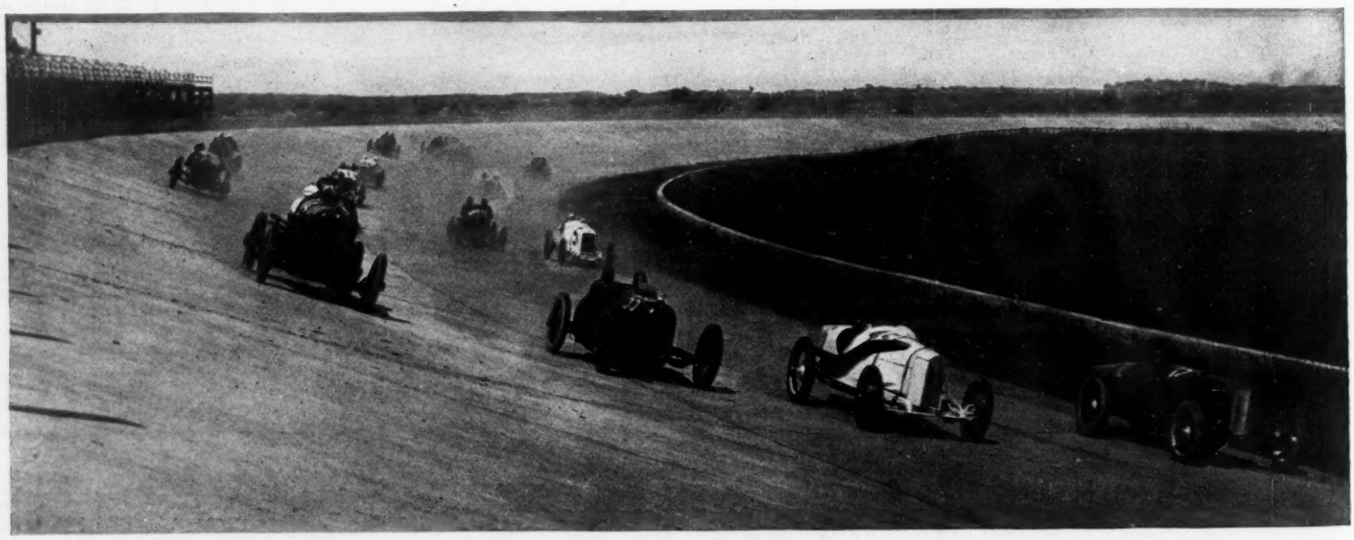
Ira Vail, winner of 100-mile race at Minneapolis, in which he broke the track record

By William K. Gibbs

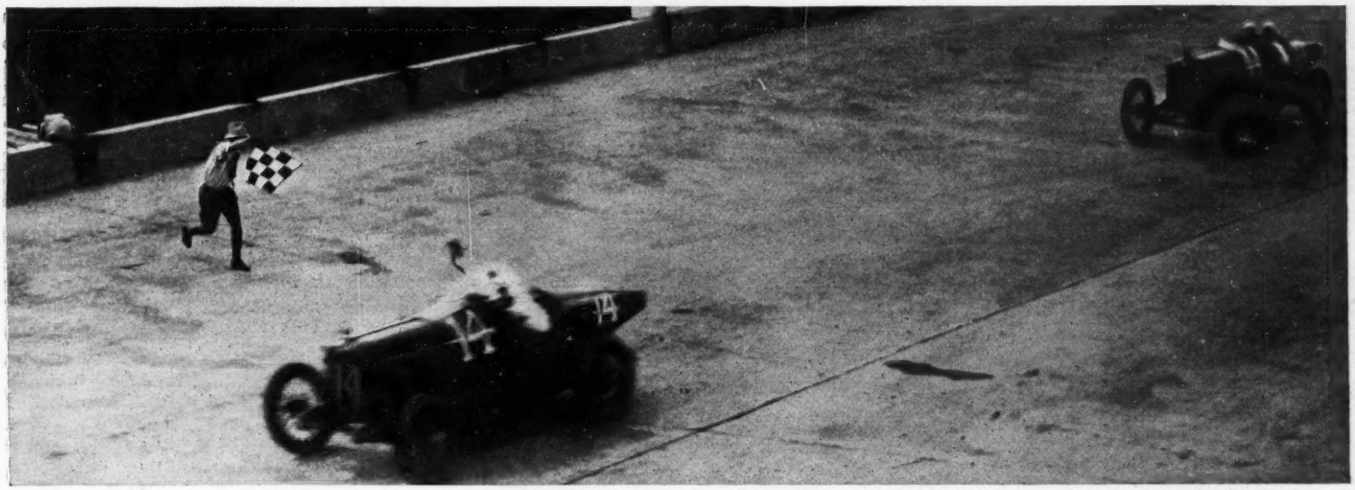
FORT Snelling Speedway, Minn., July 14—The Twin City 2-mile cement speedway to-night might be likened to the man who, having lost all his friends, finds himself somewhat popular again. Followers of motor racing sport know the past difficulties of the Minneapolis track, which made its debut two years ago. Serious charges of mismanagement were made against the promoters; the general public was incensed at the first race—500 miles—when persons found they must pay an extra dollar at the track after they had paid for their tickets. Consequently when the meet was staged a year ago there were only a handful of people who attended. The bill was cut down and the advertised prize money could not be paid. A 150-mile race was put on but the winners got only a part of their winnings. The American Automobile Association withdrew the license of the track for 2 years. Consequently racing here was looked upon as dead.

To-day's races were promoted by the drivers. It was unfortunate that this fact was not better advertised. Proper publicity undoubtedly would have brought out a better crowd. However, those who came—perhaps 6000 or 8000—witnessed some real racing and saw the track record broken. Commendation is due the drivers for putting zest into the program, even in face of the knowledge that their winnings on a percentage-of-the-gate basis would barely cover expenses. Another unfortunate occurrence was the tearing up of the street railway tracks leading to the speedway. The railway company, believing there would be no races here for another year at least, and not being able to buy rails, took up the tracks to the speedway only two weeks ago to make improvements elsewhere. Receipts were $5,300, 10 per cent of which went to the Red Cross and expenses exceeded the balance by about $750. Therefore drivers got nothing but honor and glory. Cups may be given later.

Ira Vail took the honors in the 100-mile event this afternoon, pushing his Hudson through without a stop to the tune of 96.28 m.p.h. Dave Lewis in the Hoskins was second and Earl Cooper's Stutz, which won the first race on the Fort Snelling track from a sister car driven by Gil Anderson by a fourth of a second, tooled by Earl's mechanic, Dutton, placed third, Lewis and Dutton fighting a close battle and averaging 94.38 and 94.36 respectively. Looking



Sixteen cars started in the 100-mile event and they are seen here coming into the home stretch on the preliminary lap



Vail's Hudson getting the checkered flag in the 100-mile race at Fort Snelling speedway, July 14

at the times in previous events and comparing them with to-day's race of 100 miles, Vail's time to-day is faster than ever was made for the century here. In 1915 Anderson's Stutz led at 100 miles, his time being 1:06:18; Cooper pushed his Stutz across the tape for fifty laps of the 2-mile course in 1:07:49. In last year's 150-mile event Ralph de Palma's Mercedes did the century in 1:05:52, while Vail's time to-day was 1:02:19.73—3 min. and 33 sec. faster than anyone else ever drove 100 miles on this track. Cooper took the 1915 race at 86:35 m.p.h.; de Palma won in 1916 at 91.08 and Vail bettered this mark by 5.20 m.p.h., or at 96.28 m.p.h.

Sixteen cars started in the 100-mile event to-day and only five fell by the wayside. Dave Lewis' Hoskins had the pole and Hearne's Duesenberg, Cadwell's Miller special and Vail's Hudson were lined up beside Lewis. In the second row were Dutton's Stutz, Sarles' Frontenac, Sarles driving in place of Joe Boyer who could not come on account of some government business, Chevrolet's Frontenac and Henderson's Duesenberg. The third row from the pole ranked: Milton's Duesenberg, Fontaine's Mercedes, Toft's Omar and Mulford's Hudson, while fourth row was made up of Taylor's Hudson, Mason's Ogren, Haibe's Ogren and MacBride's Olsen special.

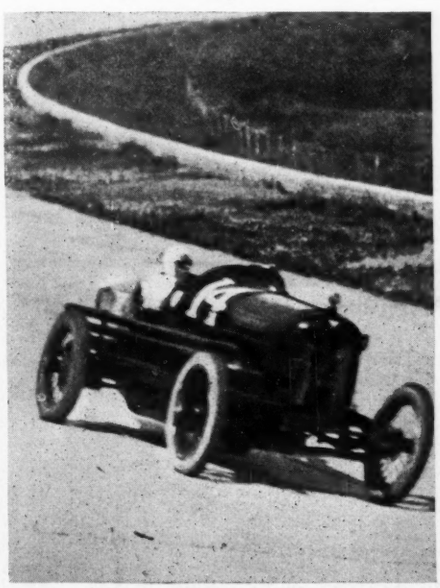
Vail Takes Lead

Vail jumped into the lead when going into the first turn on the first lap and at the end of the lap the order was: Vail, Hearne, Dutton, Cadwell, Lewis, Chevrolet, Sarles, Mulford, Fontaine, Taylor, Henderson. In the third lap Eddie Hearne took the lead away from Vail, Dutton and Fontaine following Vail close. In the fourth lap Fontaine brought the Mercedes to third place, displacing Dutton's Stutz. Only a car length separated Hearne and Vail and the latter took the lead again at 12 miles, Hearne dropping out two laps later, the inside of his hands having been worn raw from trying to hold his car on the wavy track at high speed. From then on Vail never relinquished his position at the head of the field although he slowed up slightly toward the end of the race when he was two laps to the good and saved his car.

Vail, Lewis, Dutton and Sarles held one-two-three-four throughout the race. They alternated for place frequently but none of them ever got below fourth place among the winners.

The 50-Mile Race

Of the two main events this afternoon, the 50-mile perhaps was the more exciting. Eleven cars started, these being: Lewis' Hoskins, Vail's Hudson, Dutton's Stutz, Chevrolet's Frontenac, Henderson's Duesenberg, Milton's Duesenberg, Mulford's Hudson, MacBride's Olsen special, Mason's Ogren, Toft's Omar, and Taylor's Hudson, lining up in the order named with Lewis at the pole. Louis Chevrolet took the lead and held it for 8 miles, then slowed down and went out at the end of 12 miles. The Hoskins only lasted three laps, which cut the field to ten. The order at 10 miles, with ten cars running was: Dutton, Vail, Chevrolet, Mulford, Milton, Henderson, Taylor, Toft, Cadwell and MacBride. The proverbial blanket would have covered the four leaders. Up to 20 miles Dutton and Vail still worked on a fifty-fifty basis, Vail sometimes being a foot or two ahead on the backstretch, Dutton forging a little ahead at the tape. Mulford moved up to third when Chevrolet dropped out and Dutton, Vail and Mulford ran one-two-three from the twelfth to the thirtieth mile, when Mulford stepped up to second, Vail coming to the pits with smoke rolling from his brakes at the end of 34 miles. Vail dropped from second to fifth place when he stopped to cool his brakes but at 46 miles was back in third, where he finished. Dutton did not make a stop and finished 1 min. and 42 sec. ahead of Mulford. Only 31 sec. separated the three Hudsons, which finished second, third and fourth.



Vail's Hudson coming out of turn into homestretch

Maxwell Wins Ford Race

The preliminary race was scheduled as a Ford race but for some reason a Maxwell was allowed to compete, and, competing, won. Three cars were entered, J. Wiederhold's Maxwell, which did the 10 miles in 10 min., 8.45 sec., his speed being 59.17 m.p.h.; Joe Marshall's Ford special which turned the 10 miles at 50.04 m.p.h. and Forstner's Ford special which ran third at 48.98 m.p.h. The winner took a Red Cross trophy.

The three Hudsons did a circus stunt, ostensibly to see which of the three was the fastest. Driving 10 miles, Mulford did 89.75 m.p.h.; Taylor, 89.66, and Vail, 89.59; their times being 6:41.10, 6:41.55 and 6:41.85 respectively.

Between the 100-mile and 50-mile races a 20-mile race was put on that had as entries a National that smoked like a tugboat, a Marmon that had seen better days and which could not get up even a good touring speed, the Maxwell that won the Ford race and another rebuilt Ford. The last named lasted two laps, the Marmon four laps and the Maxwell made so many

The Minneapolis concrete course is hard on tires. Lewis stops for a change of casings. Note difference in treads of the new tire and the one being removed. This was early in the race

stops to tie down its hood that the National had won when it had finished but 16 of the 20 miles. The National coasted in on the last lap, winning the Red Cross trophy at a speed of 73.9 m.p.h. It was a motley lot of entries that looked like they had been taken from the stock of some dealer in second-hand cars.

Bondholders in the Fort Snelling track leased the speedway to the drivers and the other promoters of to-day's events without consideration, although it was mutually understood that if considerable money was made something would be paid for the use of the track. The move was made more to rehabilitate the course in speedway racing. Ten per cent of the gross receipts were given to the Red Cross and this means not only from gate admissions but from the concessionaires as well. Fifty per cent of the net was to be given the drivers, but there was no net.

Good Roads Convention 3 Miles High

(Continued from page 18)

designated Route No. 1 by the Nevada State Highway Commission. Two thousand dollars worth of culverts have been placed and other work done on this link in the last few weeks, and the closing session received a telegram from Elko that Elko County would immediately improve their part of the road.

The New Jersey link of 71 miles runs from Easton, Pa., to New York City through Phillipsburg, Washington, Hackettstown, Schooley Mountain, German Valley, Chester, Crester Crossroads, Mendham, Morristown, Convent, Madison, Chatham, Springfield, Irvington, Newark, Union and Weehawken. The 455-mile Nevada link is through Tecoma, Montello, Cobre, Wells, Deeth, Halleck, Elko, Carlin, Beowawe, Battle Mountain, Golconda, Winnemucca, Mill City, Imlay, Oceana, Lovelock, Wadsworth, Reno and Verdi.

Official markers will be placed this year along both the Nevada and New Jersey sections, and the signboarding will be repaired, renewed and added to wherever needed all along the line from New York and Philadelphia to San Francisco. Particular attention will be given to clear marking through the cities on the route. An order was authorized for 50,000 official route cards with one side left blank for filling in sectional logs by division officers, motoring and commercial organizations, etc.

The delegates worked hard and in a businesslike way, but they also went in for plenty of fun, and this was provided in abundance by the Colorado Springs Chamber of Commerce, with the co-operation of the Pike's Peak and the Crystal Park Auto Highway Companies and other entertainers. The visitors had the thrill of a hard snowstorm on the summit of Pike's Peak, and showed high efficiency in disposing of a chicken dinner at Glen Cove, 11 miles up on that $250,000 scenic motor road of 18 miles up the side of the great mountain, a trout fry at the 8700-ft. summit of the charming Crystal Park highway and similar affairs of hospitality, and everywhere wore a smile of genuine "We thank you."

Among the resolutions of appreciation adopted was one giving MOTOR AGE a unanimous vote of thanks for the effectual publicity it has given the Pike's Peak Ocean-to-Ocean highway at different times and for its interest in sending a representative to the midsummer convention. A recent trip article in two parts on a 225-mile scenic section of the Colorado division of the road, by William K. Gibbs, came in for special praise on part of every delegate.

ILLINOIS ROAD BOARD NAMED

Chicago, July 16—The official machinery of the $60,000,000 good roads project in Illinois has been completed and will be put under way at once. Governor Lowden has named the members of the Board of Highway Advisors. They are Robert Lee Clarke, William D. Edens, Chicago; Homer J. Jice, Greenview; Joseph M. Page, Jerseyville, and A. R. Hall, Danville. This

Equipment of All Cars Starting in E vents at Fort Snelling Race, July 14

No.	Car	Driver	Bore	Stroke	No. Cyl.	Cast	Valves No.	Valves Loc.	Carb.	Ignition	Plugs No.	Plugs Kind	Tires	Size	Lub.	W. B.	Wheels	Motor
5	Stutz	Dutton	3 1/8	6.500	4	Blk.	16	Head	Miller	Bosch	8	Rajah	Goodyear	33x5	Aristo	104	R-W	Boyce
7	Duesenberg	Milton	3.750	6.750	4	Blk.	16	Side	Miller	Bosch	8	A.C.	Goodyear	33x5	Oilzum	106	R-W	Boyce
8	Duesenberg	Henderson	3.750	6.750	4	Blk.	16	Side	Miller	Bosch	8	A.C.	Goodyear	33x5	Oilzum	106	R-W	Boyce
9	Hudson	Mulford	3.500	5.000	6	Blk.	12	Side	Hudson	Delco	6	A.C.	Goodyear	33x5	Oilzum	107	R-W	Boyce
12	Hoskins	Lewis	3.750	6.750	4	Blk.	16	Head	Miller	Bosch	8	Rajah	Goodyear	33x5	Oilzum	105	R-W	Boyce
14	Hudson	Vail	3.500	5.000	6	Blk.	12	Side	Hudson	Delco	6	A.C.	Goodyear	33x5	Oilzum	107	R-W	Boyce
29	Omar	Toft	3.750	6.750	4	Blk.	16	Side	Miller	Bosch	8	Rajah	Goodyear	35x5	Oilzum	106	R-W	Boyce
44	Hudson	Taylor	3.500	5.000	6	Blk.	12	Side	Hudson	Delco	6	A.C.	Goodyear	33x5	Oilzum	107	R-W	Boyce
45	Duesenberg	Hearne	3.750	6.750	4	Blk.	16	Head	Miller	Bosch	8	Rajah	Goodyear	35x5	Oilzum	106	R-W	Boyce
49	Olsen	McBride	3.750	6.750	4	Sing.	16	Head	Miller	Bosch	8	Affinity	Goodrich	33x4½	Oilzum	107	R-W	Boyce
51	Frontenac	Sarles	3.780	6.375	4	Blk.	16	Head	Miller	Bosch	8	K.L.G.	Goodyear	33x5	Oilzum	104	R-W	Boyce
52	Ogren	Mason	3.625	7.000	4	Blk.	16	Head	Miller	Bosch	8	Rajah	Goodyear	33x5	Oilzum	109	Houk	Boyce
54	Frontenac	Chevrolet	3.780	6.375	4	Blk.	16	Head	Miller	Bosch	4	K.L.G.	Goodyear	33x5	Oilzum	104	R-W	Boyce
55	Miller	Cadwell	3.625	7.000	4	Blk.	16	Head	Miller	Miller	8	A.C.	Goodyear	33x5	Castor	104	R-W	Boyce
56	Mercedes	Fontaine	3 1/8	6.500	4	Blk.	16	Head	Murad	Bosch	6	Gross-Sp.	Goodyear	33x5	Monogram	102	R-W-	Boyce
57	Ogren	Haibe	3 3/32	6.000	4	Blk.	8	Side	Miller	Bosch	8	Rajah	Silver	33x4½	———	102	Houk	Boyce

All cars were equipped with Hartford shock absorbers except the Mercedes, which had Mercedes.

commission operating under the new consolidation law will exercise a general supervisory direction over the construction, improvement and maintenance of all state highways.

MAY TRAIN AIRPLANE PILOTS

Detroit, July 16—It is possible that the Michigan State Auto School will be made an official motor school for training airplane mechanics enlisted in the signal corps. Arrangements have been made with Chief Signal Officer at Washington, who is awaiting the passage of the "Personnel Bill" now before congress, to authorize the passage of the bill. Lieut. Glenn T. Cummings, D. S. O., who was in active service with the British Royal Flying Corps for fourteen months, has been retained as consulting engineer in the branch of military mechanics. Several types of engines have been obtained, and the training will start as soon as authority from Washington is received.

AUTOMOTIVE FACTORY INVENTORY

Washington, D. C., July 16—The automotive committee of the Council of National Defense has inaugurated a comprehensive industrial inventory of the automotive industries, including motor car, airplane, and water-craft factories, to make available to the Government all possible information regarding their manufacturing facilities and the possibilities of expansion for Government work. The inventory is being taken by the industrial inventory section of the Council of National Defense and the first replies already have come in. The work will be completed probably within two or three weeks. This is similar to the inventory of the industry made last year under the direction of Howard Coffin.

The undertaking was inspired by the approaching great demand on the industries for airplane engines, motor trucks, tractors, and motor boats for war purposes.

The new blanks being sent out are much simpler than those formerly used, as experience in war needs has demonstrated the superfluity of some of the details asked for last year.

The inventory will give the Government authorities exact information as to just what can be expected from each plant, and will also give a thorough insight into the requirements of the industries in the way of additional labor and machinery, making it possible to plan accurately and intelligently for expansion.

Time of All Finishers in 100-Mile Fort Snelling Race

No.	Driver	Car	20 miles	40 miles	60 miles	80 miles	100 miles	M.P.H.
14	Vail	Hudson	12:25.50	24:41.50	37:02.02	49:38.75	1:02:19.73	96.28
12	Lewis	Hoskins	13:11.65	26:02.85	38:45.70	51:13.00	1:03:34.68	94.38
5	Dutton	Stutz	12:46.10	25:13.78	37:29.05	51:15.10	1:03:35.06	94.36
51	Sarles	Frontenac	12:35.85	25:08.88	37:40.55	52:25.75	1:04:46.17	92.64
9	Mulford	Hudson	13:24.90	27:24.10	40:15.65	53:51.90	1:06:13.07	90.61
44	Taylor	Hudson	13:14.34	26:07.85	39:56.60	54:13.70	1:07:20.30	89.10
55	Cadwell	Miller	13:13.70	26:52.55	40:30.94	54:16.15	1:08:07.20	88.08
7	Milton	Duesenberg	13:23.60	26:15.00	43:46.40	55:57.15	1:08:27.85	87.637
8	Henderson	Duesenberg	13:24.93	26:39.55	39:43.80	54:23.75	1:08:28.00	87.633
32	Mason	Ogren	13:36.90	42:58.70	58:27.25	Flagged		
39	Toft	Omar	15:41.10	31:35.75	48:35.80	1:03:24.08	Flagged	

Time Each 10 Miles in 50-Mile Race at Fort Snelling

No.	Car	Driver	10 miles	20 miles	30 miles	40 miles	50 miles
5	Dutton	Stutz	6:04.00	12:07.60	18:07.55	24:17.95	30:50.91
9	Mulford	Hudson	6:06.85	12:08.30	18:08.53	25:18.75	32:32.26
14	Vail	Hudson	6:05.55	12:07.95	18:08.00	26:45.65	32:47.06
44	Taylor	Hudson	6:21.80	12:57.05	19:38.30	26:17.80	33:03.81
8	Henderson	Duesenberg	6:19.02	12:41.18	20:40.45	27:03.75	23:25.15

TRUCK AWARDS IN CHICAGO

Chicago, July 17—Awards of Government contracts for military trucks from this date on, it is understood, will be made from the Depot Quartermaster's office of the Central Department in Chicago.

PACKARD GETS U. S. ORDER

Detroit, July 17—Special telegram—The Packard Motor Car Co. has just received an order from the U. S. Government for 1800 3-ton truck chassis. This order involves $5,000,000. Deliveries will start with 100 trucks in August and 500 a month thereafter. This is a general-purpose chassis of the type used extensively by the Allies.

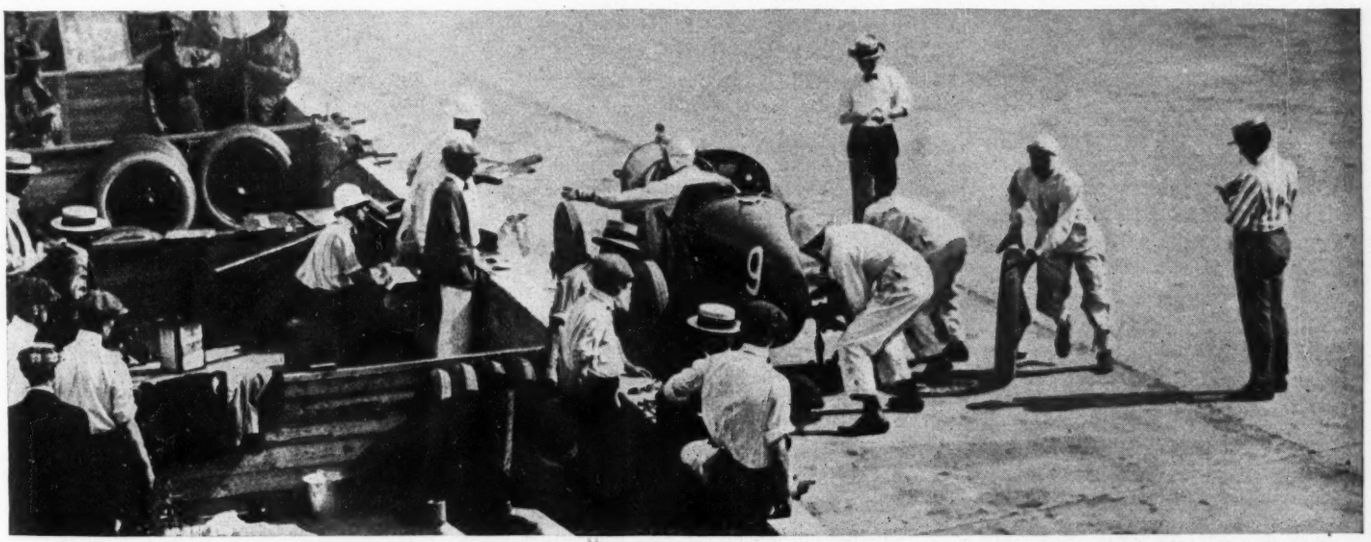
It is to be taken from this that the Government is going ahead with placing of orders without waiting for the final whipping into shape of the standard 3-ton truck specifications.

THREE MORE A. M. A. MEMBERS

New York, July 16—Three companies were elected members of the Aircraft Manufacturers' Assn. at a meeting held last week. These are the Dayton Wright Co., Dayton, Ohio; Wright-Martin Aircraft Corp., New York, and the Aeronautical Engine Division of the General Vehicle Co., Long Island City.

INTER-CITY RUN OFF

Chicago, July 14—Word was received here last night that the Inter-City reliability contest, which was to be a three-day run out of Buffalo and return July 17, 18 and 19 has been called off. The New York contingent could arrange for only two cars and the Chicago contingent, which had planned to start nine cars overland this morning, withdrew. Whether or not the other two teams—Buffalo and Rochester—will compete is not known as yet.



Ralph Mulford brings his Hudson in for a tire change in the 50-mile event. He did not lose his position. The change was one of the quickest of the day

Dealers Now Organized

Stormy Sessions at Chicago End in Harmony and Much Good Results

Membership Takes in All, Whether Large or Small Concerns

CHICAGO, July 12—The National Automobile Dealers' Association was formed here yesterday by dealers and distributors from the principal cities of the United States.

It is to be made up exclusively of motor car dealers and distributors. There are nearly 30,000 possible members in this country.

While the organization was formed by men mostly from the big cities, the membership is not to be confined to the big men; provision is made for the membership of every man who sells cars, no matter how small or how large. Branch managers also are included.

In order that the work may be clearly defined and the efforts of the organization not scattered over too wide a field, it was decided not to attempt to cover the garage or repair trade. The problems of the dealer are considered somewhat different from those of the exclusively garage man.

The association is founded on the local association idea. Any dealer to become a member of the national must first be a member of an association in his city, county, state or local section. It was believed this plan will work out best in making the organization successful.

Despite a hot two-day session, Tuesday and Wednesday, in which debate was heated and men argued and contested, complete harmony prevailed at the end and the directors at once began consideration of ways and means for making the association "the biggest thing that ever was in the motor trade."

Coöperation is to be the keynote. There is no intention of fighting against manufacturers, the government or anyone else. It is believed the best results will be secured by the mutual coöperation of all for mutual benefit.

The officers are:

President, George W. Browne, Milwaukee; president of the Milwaukee Automobile Dealers, Inc., and Overland distributor in Wisconsin.

First vice-president, John H. MacAlman, Boston; Stearns dealer and president of the Boston Automobile Dealers' Association for fourteen years.

Second vice-president, F. W. A. Vesper, St. Louis; Buick distributor.

Treasurer, Thomas J. Hay, Chicago; Chandler dealer.

Secretary, Bart J. Ruddle, Milwaukee; secretary of the Milwaukee Automobile Dealers, Inc., and manager of the Milwaukee shows.

Directors: East and South—John H. Johnson, Boston; A. E. Maltby, Philadelphia; George D. McCutcheon, Atlanta. Central West—W. G. Tennant, Chicago; John A. Graham, Minneapolis; C. A. Forester, Cleveland. Far West—P. E. Chamberlain, Denver; P. H. Greer, Los Angeles; Dean Schooler, Des Moines.

In addition there is to be a vice-president appointed for every state to act as a director of affairs in his section.

The meeting times and places are to be chosen by the directors. The next has not been selected.

BELDEN IS OVERLAND ENGINEER

Toledo, Ohio, July 16—The Willys-Overland Co. has made E. H. Belden, widely known in motor car engineering circles, chief engineer in full charge of the engineering departments.

Belden has been affiliated with the Overland for the last six months, during which time he has been in charge of the research department. Prior to his coming to Toledo he occupied the position of engineer of the Packard Motor Car Co. of Detroit.

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124 M.P.H. for Packard

NEW YORK, July 14—What are probably new speed marks for 1, 2, 4, and 6 miles for cars of over 300 cu. in. displacement were made to-day by a Packard equipped with an aviation twelve cylinder engine, when it made these distances, respectively in 29⅘ sec., 58 sec., 1 min. 57⅕ sec., and 3 min. flat, averaging 121, 124, 122, and 120 m.p.h., respectively. The Brooklands record of 29.01 for the mile made by Hornsted in a Benz, June 24, 1914, still stands, but the 2-mile mark of 58.99 made by him the same year has been bettered. The best American track records for those distances previous to to-day's times were 31.6 sec. made by Oldfield in a Christie at Tacoma, July 5, 1915, for the mile; 1:10 for 2 miles also by Oldfield in the same car at Tacoma; 2:20 for 4 miles made by Resta in a Peugeot at Sheepshead Bay, Oct. 9, 1915.

But for tire trouble new world's records from 10 miles up probably would have been made and it is the intention of J. G. Vincent, designer of the engine, again to hold tests on the same speedway at which time he will go after the long distance records, many of which are held by a Sunbeam, driven by Chassagne and Resta in 1913. The 4 by 6 engine used to-day is slightly changed from that described recently in MOTOR AGE. Nt has steel cylinders and there are a few minor changes.

During the tests to-day the car was driven near the top of the track, its position being marked off by Mr. Vincent, it being figured that the car was actually making 10,845 ft. to each lap of the 2-mile course.

Britain Needs Tractors

English Want Machines to Get Soil Ready for Planting This Fall

More Intensive Farming to Increase Production 33 Per Cent

DETROIT, July 16—England is not worrying about its grain supply for this season, but there is need for a large supply of tractors to increase the farm area available for the fall and spring planting, according to C. E. Sorenson, manager of the Ford Tractor Farm at Dearborn, Mich., who had just returned with P. L. D. Perry, president of the Ford Automobile Co. of Great Britain, from the other side.

Mr. Sorenson said the Ford company had been asked by the British government to hasten its production on tractors in order that the machines will be ready for use for the season mentioned and one of the buildings is already well under way with the other sections of the Cork factory ready to be started. The productive ability of 50,000 tractors a year will be reached in about eight months, but before that time there will be a productive ability of 10,000 per annum.

It is also intended to ship a great number of the tractors over from this side, and the Ford tractor plant at Dearborn will be on a production basis in less than 60 days. The limiting factor on this side as well as on the other side of the water is the ability to secure raw material. With the government recognition of the importance of a large tractor output, however, it is expected that this will be eliminated and will not be cut off.

The present scheme, according to Messrs. Perry and Sorenson, is to increase the productive area of the British Isles by about 33 per cent. This will indicate a larger proportionate increase in the amount of grain produced because it is expected that by means of the tractor the plowing and reaping can be carried on under much more advantageous conditions from an argricultural standpoint with the result of a more intensive output.

One of the factors that must be watched is the beer problem. It is stated that more wheat should be put into bread and less into beer. Some of the wheat being exported from this country to the other side is going to the breweries and not to the flour mills. This is a delicate condition on account of the demand of the laboring classes for beer and the undesirability of arousing animosity by denying it. This situation is one which must be recognized, however, and a balance struck that will satisfy the working classes without interfering with the nation's food supply.

The tractor is looked upon as one of the

greatest assets in the war, but the difficulty is the raw material situation. Great Britain cannot supply these and America is looked to as an important aid. The result is that in a very short time finished tractors as well as the materials for making them on the other side of the water will be crossing the Atlantic in great quantities.

STUDEBAKER GIVES COLOR OPTIONS

South Bend, Ind., July 11—The Studebaker Corp. now gives purchasers of its series 18 cars four options in color and has a new top known as the Gypsy top of semi-permanent type with the front part extended to cover the entire body of the car to the windshield. It is an evolution of the old Victoria type top.

WILLYS HEADS CURTISS

Toledo, Ohio, July 16—John S. Willys, president of the Willys-Overland, Inc., was elected president of the Curtiss Aeroplane Co. at a meeting of corporation directors yesterday. He succeeds John H. Curtiss, who became chairman of the board of directors. William A. Morgan of Buffalo is elected vice-president and general manager in charge of all operations.

FORD'S MERCHANDISING PLAN

Detroit, July 10—The Ford Motor Co. has inaugurated a new policy for merchandising Ford cars by which the sales manager of each Ford agency must intensively cultivate his territory. The plan comprises a map which shows clearly each township in the agency, the sections of the townships and practically every resident.

The sales manager is provided with thumb tacks of different colors and these are placed on the map. One color displays the number of prospects, another the 1917 Ford cars in the district, another the old Ford cars, another the other makes of cars, and a last tells those residents who have no cars. After the map is thus arranged the sales manager must fill in a blank sheet enumerating the same data as is told by the thumb tacks on the map. This is then sent to the Ford Motor Co. and informs it of the exact situation in every territory.

FISK TO GET GIBNEY

Philadelphia, Pa., July 16—Henry C. Thompson, receiver for the Gibney Tire & Rubber Co., Conshohocken, Pa., was ordered by Judge Thompson, in the U. S. district court at Philadelphia, to sell the assets of the company to the Fisk Tire & Rubber Co. The price of the sale was fixed at $408,187, being the amount of the assets of the company. The Gibney firm was allowed several delays by the court to make a settlement with the creditors or to bid higher than the Fisk company. The Gibney plant will formally be taken over by the Fisk company about July 20. No changes in the branch offices is contemplated at present.

Sets a Good Example

Empire State Shows How to Stimulate Intensive Cultivation of Soil

Commission Buys 41 Tractors and Loans Them to Farmers

ALBANY, N. Y., July 16—New York state is giving a practical demonstration of how to co-operate in more intensive agriculture and food conservation connected with the war. The state has a commission known as the New York State Food Supply Commission. This commission purchased forty-one farm tractors, thirty-six of which have already been permanently loaned to responsible organizations throughout the entire state. The state purchased these machines with three objects in mind:

1—To increase the crop production throughout the state.

2—To prove the feasibility of the plan of aiding agriculture in this way.

3—To ascertain the adaptability of the tractors to the various sections of the state.

The plan of the food commission for loaning these tractors to different organizations is as follows: The commission will loan a machine to any organization of responsible farmers provided they will agree to all conditions imposed by the commission. The commission makes a charge of $150 for a two-plow outfit, and $175 for a three-plow outfit, covering its use up to Dec. 1, 1917. This charge is supposed to cover mechanical depreciation only.

Farmer organizations receiving such a machine must hire a competent operator, purchase all fuel and oil, make all necessary repairs, and then charge the farmers for whom they plow so much per acre or per hour to cover the expense of the operation.

The New York State Food Supply Commission has gone further in that it has purchased three power ditching machines to be used throughout the state.

A still further example of the war activity of this commission is the purchase of power potato spraying machines, to be rented to farmers now raising potatoes in greater quantities than formerly, but in such quantities as not to warrant purchasing a machine of this type.

Price Increases

CONNERSVILLE, Ind., July 16—Effective Aug. 10, all Minute Man models of the Lexington will advance $60.

CADILLAC TRUCK PRICES UP

Cadillac, Mich., July 16—The Cadillac Auto Truck Co. has announced an increase in the price of all its models, the one-ton now selling for $1650, the 2-ton for $2300 and the 3½-ton for $3100. This change in price became effective July 1.

PAIGE PRICE CHANGES REVISED

Detroit, July 14—The recent announcements of the price increases by the Paige-Detroit Motor Car Co. have been revised. The new revision shows price increases to be as follows: The Stratford 6-51, $1,595; Fairfield 6-46, $1,450; Linwood 6-39, $1,260; Brookland 6-51, $1,795; Dartmore 6-39, $1,260; limousine 6-51, $2,850; town car 6-51, $2,850; sedan 6-51, $2,400; sedan 6-39, $1,875.

U. S. TRUCK PRICES UP

Grand Rapids, Mich., July 14—The United Motors Co. has increased prices of its worm driven trucks as follows: Two-ton from $2,250 to $2,350; 3½-ton, $2,900 to $3,150; 4-ton, $3,200 to $3,450; 5-ton, $3,900 to $4,250. No advances on tractor prices have been made. Tractor production is now in progress. One hundred tractors are to be produced this month and 200 a month will be the production maintained beginning August 1.

LELANDS PERFECTING PLANS

Detroit, July 16—Henry M. Leland and son Wilfred C. Leland have returned to Detroit following a conference with government officials in connection with their plans to manufacture airplanes for war service. Both are enthusiastic over the progress of details but are not yet prepared to make a definite public announcement. This may be expected in the near future.

The Lelands have both completely resigned from the Cadillac Motor Car Co. Their resignations were not to take effect until July 31 but arrangements were made so that they were enabled to leave the Cadillac plant last week.

SAXON JUNE DELIVERIES 2546

Detroit, July 13—The Saxon Motor Car Corp. delivered 2546 cars to owners in June Orders for July are showing an increase of 140 per cent over the corresponding period of last year.

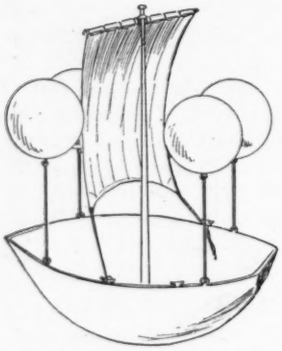
COLLINS CADILLAC PRESIDENT

Detroit, July 16—Richard H. Collins has become president and general manager of the Cadillac Motor Car Co., succeeding the Lelands, father and son. The new head of the Cadillac company was originally with the John Deere Implement & Vehicle Co., Moline, Ill. He was with this company 20 years, then became western manager at Kansas City. From there he went to the Buick Motor Co. as manager of the Kansas City branch and later to Flint, Mich., as the company's general sales manager. Last year he was made assistant to President Durant of the General Motors Co., holding this position until the recent appointment to president and general managership of the Cadillac Motor Car Co.

A. B. C. of Aviation

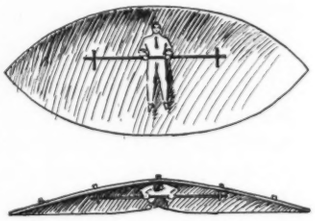
Historical

AVIATION, as an art, is the newest of man's means of locomotion, but as a dream is among the earliest aspirations of humanity. Earliest myths relate to human beings who had acquired the flying qualities of birds. The story of Icarus and Daedalus is founded on man's desire to emulate the birds. Xerxes was credited with the possession of a throne which was drawn through the air by eagles. Among the first serious attempts at mechanical flight were the investigations of Leonardo da Vinci. He made detailed sketches of bat-like wings. The art of flying is in its greatest stage of development now.



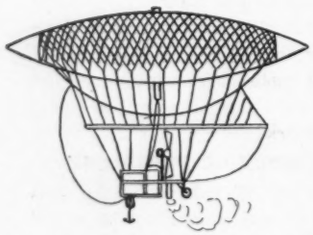
A fourteenth century scientist, Francisco de Lana, planned a flying ship to be sustained by exhausting the air from metal spheres, fastened to a boat. The boat was to be equipped with oars and sails. He proposed creating a vacuum in the spheres by filling them with water to drive out the air, then pouring out the water and putting in a cork before the air could get in.

The first machine scientifically to take into account the resistance of the air was made by Meerwein, of Baden, in 1781. The construction involved two wooden wings covered with cloth, and the operator was fastened in the middle of the under side of the wings, and over a rod by which he worked them. His attempts at flight were unsuccessful, luckily.



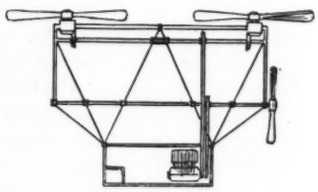
The first balloon to make a successful flight was constructed by Joseph and Steven Montgolfier, in 1783. Their first attempts were by filling bags with steam, then with smoke, and then with hydrogen. These were failures because the steam condensed and the hydrogen and smoke leaked through the bags. When they hit upon the idea of filling the bags with hot air by a fire under the open mouth, the bag rose to a thousand feet.

Naturally, earliest attempts at flight should be in imitation of flapping wings. Two have been mentioned. A German engineer, Steutzel, constructed a mechanical bird with wings, twenty feet from tip to tip, and operated by 1½ hp. carbonic acid motor. It was found to lift a weight of about seventy-five pounds, in addition to the machine itself. It was shown that a feathered wing made up of a number of small units exerts greater force than a single wing.

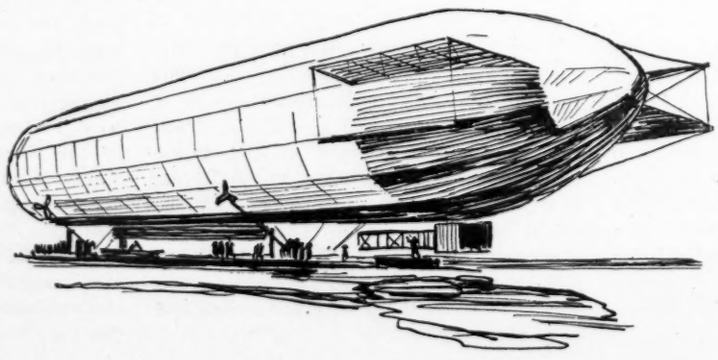


When successful flights had been accomplished with balloons, the next effort was to make them responsive to man's will, instead of that of the wind. Man power was tried and found insufficient, but in 1852 Gifford, the inventor of the injector for boilers, built a three hp. steam engine, which, with its boilers, weighed only 350 pounds. This was installed in a cage below a cigar-shaped balloon and a sail used for a rudder. Gifford managed to drive this against the wind at low speed.

Many experiments have been made with the idea of lifting by screw propellers revolving horizontally. These are called helicopters. Santos Dumont, who had distinguished himself in constructing dirigible balloons, constructed a machine of this type, as illustrated. The two horizontal propellers for lifting rotated in opposite directions, to prevent the whole machine from whirling around, and were twenty feet in diameter. The engine used was an eight-cylinder, 28 hp. gasoline engine.



The dirigible balloon has obtained its highest development in the Zeppelin, developed by the late Count Zeppelin, of Germany. The Zeppelin employs a very rigid construction. A framework of strongly braced aluminum rings was provided, this having an envelope of two bags, an outer and an inner bag, with an air space between, which acted as a heat insulator and prevented the gas within from being affected by rapid temperature changes. The early Zeppelins were



driven by 16 hp. Daimler gasoline engines, one under each end. A sliding weight could be moved backward or forward along the keel and cause the airship to point upward or downward as desired. The first trials were made in 1900. Details as to the present types are not given out, but from investigation of the raiders brought down in England recently, it is known that the size and power have been increased enormously and that the sliding weight has been replaced by horizontal rudders.

Loses His Car; Writes to Ford

COLUMBUS, Ohio, July 16—General John C. Speaks believes in going to headquarters with complaints and suggestions. When his Ford machine was stolen some time ago he wrote to Henry Ford about it.

His object, however, was not so much to notify Ford of the stealing as to make a suggestion as to the numbering of cars. Speaks suggested that each car's number be stamped into the body of the car, either back of the rear seat or on the side above the rear fender.

This would make it less easy for thieves to destroy the numbering, Speaks explains, and make it easier for the public to detect stolen cars. The numbers at present are stamped on the engine.

"I've seen 10,000 Fords since mine was stolen," Speaks said, "but I had no way of telling whether any of them was mine, because I didn't want to take the liberty to raise the hoods of other people's machines and look at the numbers." Ohio clubs soon will start a determined campaign in an effort to drive car thieves out of the state.

BUYS DIAMOND CHAIN

Plantsville, Conn., July 16—The Rowe Calk Co. has purchased the Diamond Chain Co., York, Pa., and the new officers of the Diamond Chain Co. are: President and factory manager, Samuel M. Horn, York, Pa.; vice-president, William H. McLaughlin, Hartford, Conn.; secretary, treasurer and general manager, Warren D. Chase, Hartford, Conn.; assistant secretary, S. R. Horn, and assistant treasurer, E. S. Bestor, Hartford, Conn. Business of the Rowe Calk Co., which consists of the manufacture of anti-skid chains for trucks with solid tires, has increased to a point where it was necessary for it to have some certain supply of chain to protect itself.

Mexico Revokes Part of Duty Levy

LAREDO, Tex., July 16—As a result of strong protest on the part of motor car dealers of Mexico, the federal government of that country has revoked that part of its import taxation decree which placed an import duty of 60 cents Mexican gold per kilo of 2.20 lbs. on motor cars. This duty was to have gone into effect on July 1 and the knowledge that the heavy tax was to be imposed caused a great rush of shipments of cars into Mexico from the United States during May and June.

The duty would have been practically prohibitive as it meant that a car of the weight of 1000 lbs. would have had to pay import duty amounting to $450 Mexican gold, which is about $225 American money.

The larger and heavier cars would have had to pay a still greater amount of duty which would have prohibited their sale.

How Uncle Sam Teaches Flying

(Concluded from page 15)

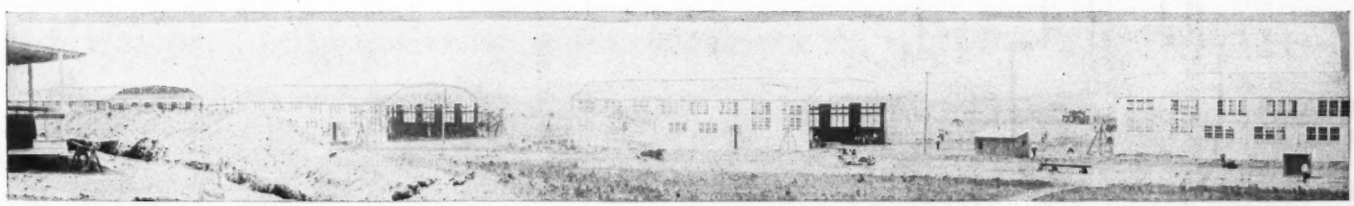
aerial performer in the world, lacking a thorough knowledge of maps and what they mean, might set out for home some fine night and find himself landing in a cozy camp where only German is spoken. Before taking the air for his daily work every fighting air-man is given two maps. The smaller of the two charts out the section of the enemy line which he is delegated to cover. The larger one, which he holds for reference, indicates a vast stretch of the belligerent terrain and is useful only in case of foul winds or a confusing detour to escape superior numbers of the Boche a-wing.

In the study of gunnery the prospective flyer comes in for one of the toughest courses in the school. He first must learn the technique of the machine gun and, as soon as a clear idea of this complicated bit of deadly mechanism is gained, he must go in for an advanced study of the weapon. He is given a chance, as it were, to shake hands with a bullet-spraying apparatus on which the conquest of the skies depends today. He must learn to "knock down" a machine gun; to take it apart and put it together again. Mother Goose's inability to restore Humpty Dumpty's broken egg shell will gain sympathy from many a puzzled boy who has unscrewed the parts of a rapid-fire gun and has been ordered to put it "together again." But the Government knows and the instructors are well aware that the war in the air is won by the aviator who knows his gun.

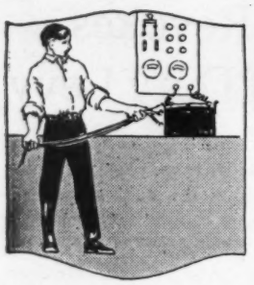
In addition to a course in bombs and bombing the cadet must familiarize himself with the theory of fighting in the air. The dizzy combats carried on hourly over the fields of Southern France are carried on under a technique learned during the present war. Most of the loopings and spiralings and head-dives practiced by an aviator attacking or escaping in a lively brush with the enemy are not the result of inspiration or guess work. There are actually practiced today two or three methods of aerial fighting.

Great stress is put upon radio work, for it is of paramount importance that every war aviator shall be an expert wireless telegrapher. More time, during the ground school course, is given up to this work than to any other branch of study. When it is stated that a flyer, under battle conditions, is called upon to run his machine with one hand and signal to the artillery with the other, it will be understood how indispensable a thorough knowledge of radio technique must be to the practical aviator.

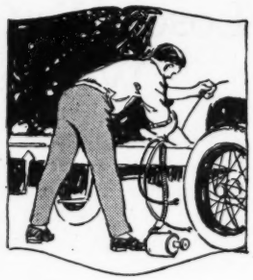
Men are being delegated to the work in the eight colleges at the rate of twenty-five a week for each school, or about two hundred a week. After August 25 the Government expects to graduate students into the advanced flying fields at the rate of 200 per week. The number to have been put into active flying by September 8 has been set at 1408, but the total will probably be less, due to the weeding-out process which is going on continually.



Hangars for the airplanes used by the Wilbur Wright Aviation camp, one of the biggest aviation schools in the United States and in the world which has just been completed and made ready for the reception of hundreds of men learning to fly for Uncle Sam



Electrical Equipment of the Motor Car



By David Penn Moreton & Darwin S. Hatch.

Editor's Note—Herewith is presented the fifty-second installment of a weekly series of articles begun in MOTOR AGE *issue of June 29, designed to give the motorist the knowledge necessary to enable him to care for and repair any and all of the electrical features of his car, no matter what make or model it may be. At the conclusion of this series, "Electrical Equipment of the Motor Car," with additions, will be published in book form by the U. P. C. Book Co., Inc., in a size to fit the pocket conveniently.*

Part L II—Ignition

Purpose of Ignition

THE ignition system of a modern motor car engine constitutes one of the most important elements of the engine and one which is absolutely necessary in order to insure engine operation. Its primary object is to afford a means of kindling or setting on fire the compressed mixture of gasoline, gas and air in the engine cylinder, and thus produce what is called an explosion. A great deal of attention has been given to the development of the ignition systems now in use and at the present time, practically all of the systems follow the same general fundamental principles which have become more or less standard due to their wide acceptance.

Early Methods of Ignition

The early systems of ignition were quite different from those in use at the present time and a brief description of several of them will be given in the following paragraphs.

In the earliest forms of the gas engine, a flame burned near a valve in the head of the engine cylinder, and when the piston was in the proper position, the valve opened, thus permitting the flame to ignite the gas back of the engine piston. This method was used in the forms of engines in which the gas and air mixture was not compressed.

It was later found desirable to compress the gas and air mixture before exploding it and in such a case the open flame could not be used. A platinum tube was inserted in the side of the combustion chamber and this tube was heated to such an extent by means of a flame directed against its walls from the outside of the cylinder that the end inside the combustion chamber was maintained at a sufficiently high temperature to ignite the gas mixture.

Later forms used the property of gases to fire or ignite themselves if compressed to a sufficient degree, and others made use of the stored heat in the cylinder walls and head to fire the highly compressed charge.

All of these various methods were not practical in their application to the gasoline engine as used on the modern motor car, due principally to the fact that they did not permit a flexible engine action which is essential in a good motor car engine. The electrical ignition systems are standard at the present time and the fundamental principles upon which they operate will be discussed in the following section.

Low-Tension Ignition System

A low-tension ignition system is one using an electric arc which is produced by a low voltage or pressure. In a system of this kind the spark is produced within the cylinder by breaking the electrical circuit between two points in the combustion chamber, called electrodes. The principle of this system is shown diagrammatically in Fig. 289. When the igniter contacts are closed in the

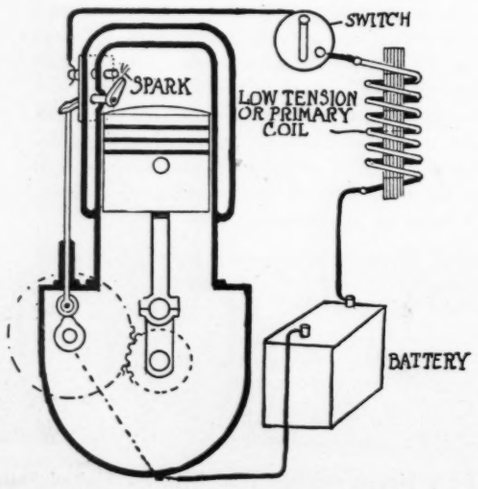


Fig. 289—Principle of low-tension ignition

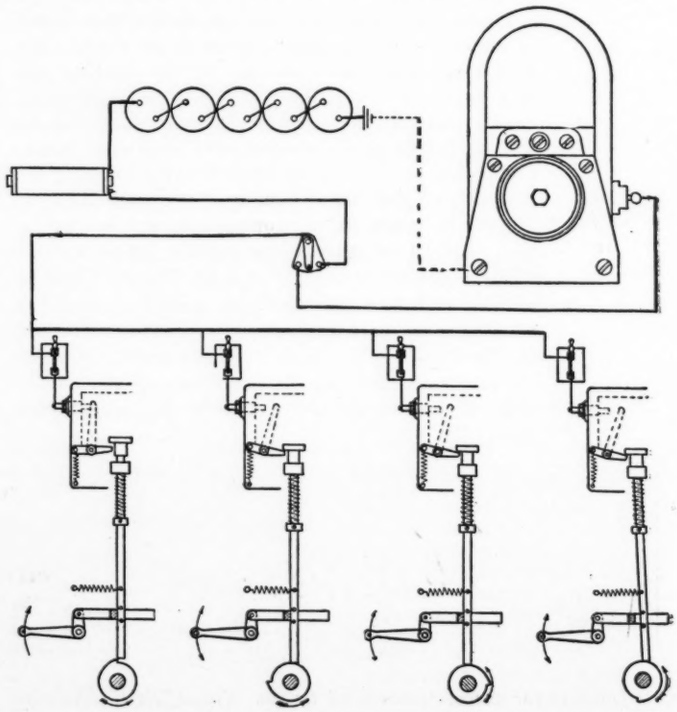


Fig. 290—Four-cylinder, low-tension ignition system

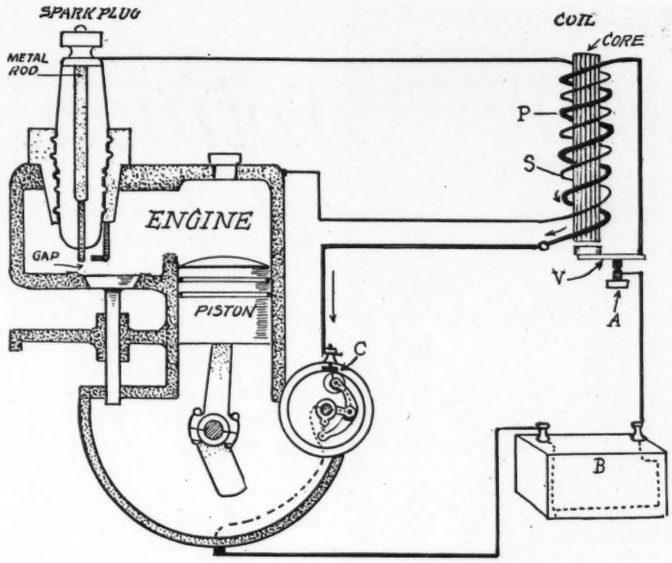


Fig. 291—Principle of high-tension ignition

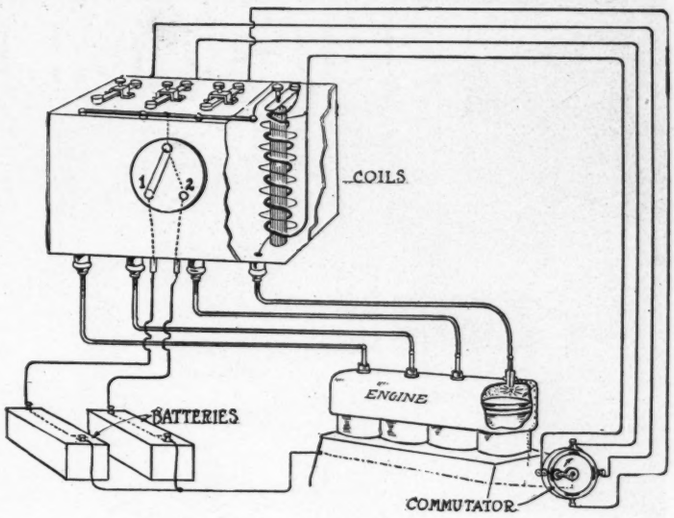


Fig. 292—Four-cylinder, high-tension ignition system

combustion chamber of the cylinder, a current will be produced in the circuit by means of the storage battery. After the engine shaft revolves a small angle, the contact in the combustion chamber is broken and when this break takes place, there will be an electric arc produced between the two parts of the igniter. A coil of wire about an iron core is shown connected in series in the circuit. This coil has a strong magnetic field produced about it and through its center when a current is established in the winding. This magnetic field represents a certain amount of stored energy just as a wound-up clock spring, and when the circuit is broken, the energy stored in the magnetic field will take some other force. As the magnetic field surrounding the coil decreases in value due to a decrease in the current in the coil, the lines of magnetic force which are supposed to constitute the magnetic field, cut the various turns of wire forming the coil and as a result, there will be an electrical pressure produced in the winding of the coil. This pressure may be and usually is many times the value of the pressure produced by the battery and as a result it tends to maintain the arc between the two terminals of the igniter when the circuit is broken in the combustion chamber. The purpose of the coil then is to give a much hotter and longer spark than would otherwise be obtained. Such a coil of course has only one winding and they are usually called primary or low-tension coils. The application of an ignition system of this kind to a four-cylinder engine is shown diagrammatically in Fig. 290. In this case the source of electrical energy is either the magneto or the five dry cells, depending upon the position in which the ignition switch is thrown.

The chief advantage of the low-tension ignition system is its freedom from short circuits caused by poor insulation of the electrical circuit. This system of ignition, however, is of only historical interest so far as the motor car is concerned as it has been discarded for several years and is now confined almost entirely to low-speed stationary engines.

This system is commonly called the make-and-break system of ignition.

High-Tension Ignition System

The operation of the high-tension ignition system is based on the fact that when a sufficiently big electrical pressure is made to act upon an electric circuit in which there is a small gap, the electricity will leap this gap and produce a small arc. The principal parts of a high tension ignition system are shown diagrammatically in Fig. 291. B is a source of electrical energy such as a battery or low-tension magneto connected in series with the primary winding P of the ignition coil, the vibrator V and the contactor C. The contact C is operated by the engine so that it makes contact at the exact time an ignition spark is required in the engine cylinder.

When the contact C is closed, a current will be produced in the primary winding of the coil which magnetizes the iron core and the vibrator V is attracted to the core. When the blade V moves away from the end of the adjusting screw, the primary circuit is opened and the iron core is demagnetized and the vibrator returns to its original position, and this operation is again repeated in rapid succession so long as the contact C remains closed. Each time the current in the primary circuit is established and destroyed, there is a high electrical pressure produced in the secondary winding. This high electrical pressure is of sufficient value to cause a current to be established between the terminals or electrodes of the spark plug, and thus produce the desired ignition spark.

A four-cylinder combination is shown diagrammatically in Fig. 292. Two batteries are provided in this case and either one may be used by throwing the switch on either point 1 or point 2.

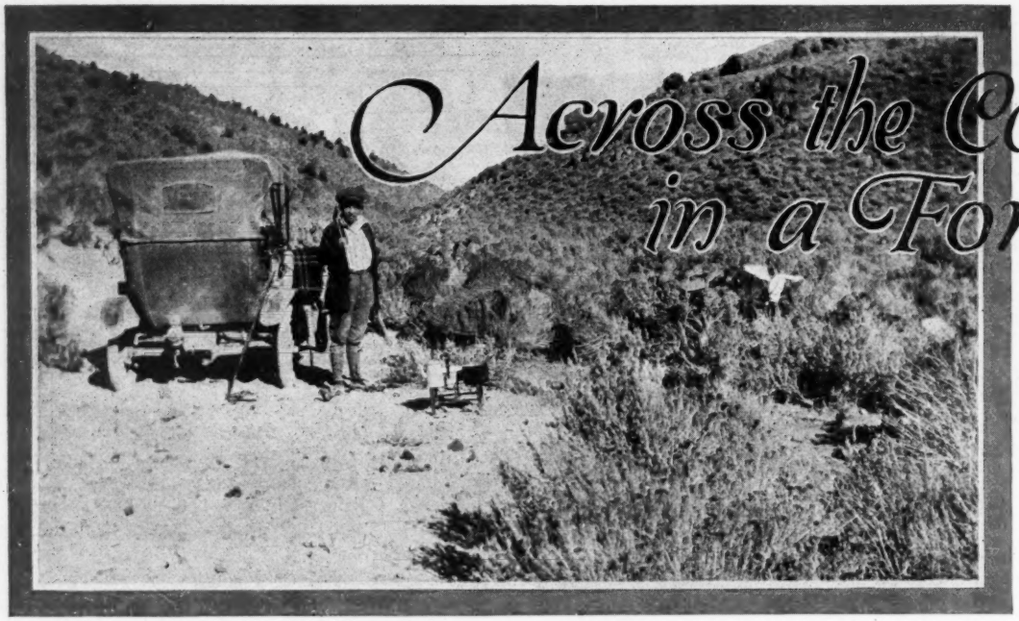
This system is sometimes called the jump-spark system.

The operation of the ignition coil will be described more fully in the next section.

R-E-A-D!

"How Motor Trucks Saved Verdun"

Unless you read W. F. Bradley's story of the activity of moto rcars and trucks immediately prior to and during the actual battle of Verdun, which is featured in this issue, you will miss one of the most graphically told stories that has come from any writer on this or kindred subjects in the Allied war zone. It reads like romance from the pen of H. G. Wells, has all the compelling interest of a Jules Verne story and truthfully depicts for the reader a side of modern warfare of which those who have not actually participated know little. W. F. Bradley, MOTOR AGE's special correspondent at the front, is a very close observer.



Across the Continent in a Ford

by Grace Laura Shelley

The ax is a very necessary aid to the motorist who, like Miss Shelley above, makes camp by the wayside and sometimes puts up at the Hotel de Ford for the night

In Two Parts—Part I

CAN women make a transcontinental motor trip? Decidedly, yes — and though perhaps those who have done this have not given their sister motorists the benefit of their experiences, it is not surrounded with as much difficulty and danger as might be supposed.

Partly as a desire for an outing, an itching for a little excitement, the hope that road experiences would be of some benefit to my sister friends who drive their own cars, I made this trip—from Chicago to San Francisco, for the major part over the Lincoln highway. There were experiences, there were excitement and troubles, but the pleasure derived overcame all—after the trip had ended.

And Without a Man

Even the strongest and best mechanically-inclined man motorist would have to receive the assistance of men on the way, but mere man is not a necessary adjunct to a motoring party, for my feminine companions and myself solved engine troubles, did man's work, braved the solitude of mountains and deserts just as boldly and just as well as if we had had a crew of professionals along.

It might have been better—for me—if I had taken the precaution to attend a flivver school before I started. It might have saved me time and distress, but experience is a grand old teacher and a month on the western roads will make a post-graduate of anybody.

Let me first of all dispel the idea that there is danger from bandits and cowboy desperadoes. Never in my life have I been more courteously treated than I was by these whole-hearted people of the West —and the farther west we went the more hospitable we found the inhabitants.

Human dangers need not be considered even, but there are roads in the mountains that can cause trouble, particularly to one inexperienced in driving over grades, especially if every part of the car is not in the pink of condition to assert its reliability in cases of possible emergency. The one great danger eliminator may be said in two words—good brakes.

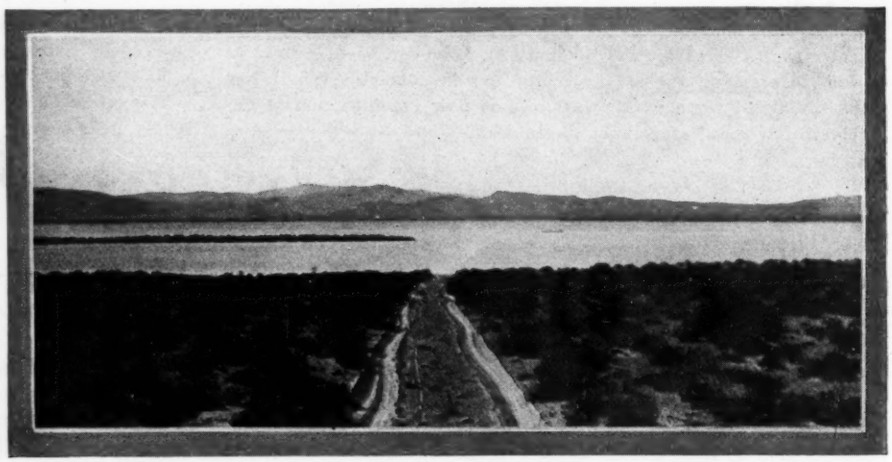
Two weeks of driving at 10 hrs. a day will land a motoring party in San Francisco from Chicago, and this will, according to my figures, total an average speed of 19.3 m.p.h., for the way I went was 2819.6 miles long and required 148.5 hours' driving time. Oh, yes, it took longer than that to make the trip, but we were out for pleasure and had this and a few experiences to set us back in the schedule we had laid out.

Leaving Chicago I had ample company almost to Denver, but unforeseen circumstances came to take them away, and so from Denver to Salt Lake City I journeyed in single loneliness, striving to make the Mormon center to pick up the girl companion of my school days.

Three women can think of a household of things to take, that seem necessary at the start but which come to be deemed in the nuisance class ere many miles have been reeled off. It was because of this the car was packed full and overflowing, for wire, rope and straps were necessary to retain all we three devised as necessary for comfort, utility, convenience and dolling-up purposes. Little by little things began to disappear. As fast as we discovered the unnecessary part they were playing they were thrown away, shipped ahead or back, but they were disposed of in some manner.

In Case of the Unexpected

It is not necessary to play the part of the camper, for it is possible to make a hotel every night—unless something happens. And remember, the unexpected hap-

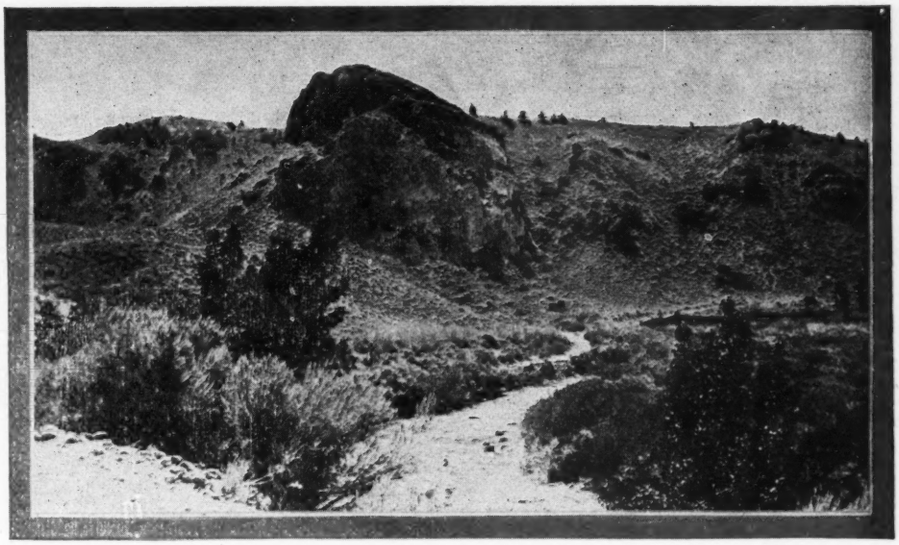


Did a lake rise up to engulf the road as once the Red sea did? Yes, but it's a dry lake, and that makes a difference

pens—and in the most inconvenient place. It always did with us.

Anyhow, we had decided to eliminate the hotel proposition and had a camping and touring outfit that would have done duty in a trip around the world. But much of it came in most handily, and we came to the conclusion that a surplus would prove far better than a shortage. To camp does not necessitate a cumbersome tent equipment, as a perfectly lovely bed can be made by cutting down the back of the driver's seat and throwing a few blankets over the cushions.

There is also a convenient and easily carried bed made to rest over the tops of the seats, permitting more room underneath for bags and clothing. Many times I have found the cozy little bed chamber of my own Hotel de Ford far more comfortable than many hotel and ranch accommodations encountered along the way.



Sweetwater Canyon road follows the stream until finally it reaches Wellington, Nev., and one more lap of the cross-country journey is made

The Necessary Accessories

To mention just a few articles of positive necessity, I would say: a motor car spade, ax, collapsible pail and wash basin, tow-line, electric lantern and flash and complete repair outfit. Before crossing the desert, add the necessary desert water bags and provisions. I would not say that as a means of protection firearms are necessities but by way of pleasurable diversion I found a rifle quite indispensable.

A popular question put to me is: What is the proper wardrobe? This broad subject may be divided into practically two classes, for those who contemplate traveling in Pullman style and for those who prefer to prepare themselves for a more rugged trip. My advice, more particularly directed to the latter class, is a suit of khaki consisting of Norfolk coat, knickers, leggings and tan shoes. Without assuming a too masculine attire one might also add the regulation sports shirts, together with one complete change of underwear, an afternoon gown and a comfortable cloak, which may stand one well in hand while crossing the chilly high altitudes. To complete this outfit I would suggest a cap safely concealing the hair from travel-dust and a pair of soft, pliable suede driving gloves.

The start was late on a delightful sunny day from that point of all starts in Chicago—Jackson and Michigan boulevards. Geneva was the objective, for this is the point where west-bound tourists strike the Lincoln highway, and DeKalb we made for the first day's stop.

Fortunately we drove to Omaha in dry weather, playing in luck, for then the Iowa highways are especially good, while in wet weather they are decidedly bad—at times impassable owing to the soapy condition of the soil. We made good time across Iowa to Omaha, as the roads were hard and smooth, and though we encountered nothing of historical interest the beautiful rolling country proved wonderfully fascinating.

During the few days spent in Omaha I had occasion to confer with tourists who had just come over the Lincoln highway from the West and, following their advice, detoured over the Omaha-Lincoln-Denver route to Denver. From here I went north, picking up the Lincoln highway again at Laramie, a route I found commendable.

My first day out of Omaha started gloriously—roads fine, engine behaving beautifully, weather most exhilarating; in fact, my thorough peace with the world was supreme. But things began to happen. There had been a shower through this part of the state during the night, making the dirt roads soft in places, and one may well imagine my consternation to find a car seemingly abandoned and all but blocking the road. To pass on the right was out of the question, while at the left I estimated I could just make it by creeping along. When I thought the deed thoroughly accomplished I was horrified to find the dirt giving way from under the outside wheels and realized that what I had mistaken for grass sod at the side of the road was in reality an abrupt descent of about 15 ft. thickly covered with grass and brush. In that moment I became convinced that my car was sure to turn turtle; still, somehow I grasped the wheel with all my strength. Then something—I never knew just what—seemed to hold the car suspended. Just then another car arrived, and with assistance I got my car back into the road and was again on the way.

Two hikers were left in charge of the disabled car while the owners returned to Salt Lake City for parts. The two, when found, were without food or water

Fate Seemed Cruel

It seems fate was against me that day, for in less than an hour, while driving over a half-mile stretch of narrow, muddy road, scarcely wide enough for two cars to pass and with a steep 15 ft. decline on either side, I saw a huge car speeding towards me. On it came, crowding my little car far to one side. I realized its driver must be irresponsible from some cause, and it was up to me to choose either a collision or a trip down the embankment. Instantly deciding on the latter course, down we went, arriving at an alarming angle and stopping

On Dog Valley grade the Ford and company. Reno, Nev., was 12 miles back, and the Ford was on its way by hard, smooth roads

in a soft mud pond. I cannot account for my escape from Heaven knows what, and by this time I was really almost nervous, wondering what next could overtake me before the day should close.

I found it necessary to engage the services of both a team and another passing motor car, the one causing all my trouble having quickly faded from view, to set me right again and on the way. Notwithstanding my nerve-racking mishaps I covered 172 miles and after a night of rest was ready for further adventure, though somehow nothing perilous happened.

Too Much Advice

I found the Nebraska prairies of interest by way of contrast with the Iowa hills just traversed, and the roads as far west as McCook really good; but from this point west to the Colorado line they were sandy and hilly with miles and miles that were exceedingly rough and choppy. It was in this country I first had sport with prairie dogs, one of their villages proving so tempting that I could not resist a few hours with my rifle, racing about over the prairie picking off just eons of them. After tiring of this, I drove to a nearby farm-house, where the people were so grateful to me for killing off the little enemies, which are terrible pests to the farmers, they insisted on my remaining for dinner, and I enjoyed myself hugely, quite making up for the nerve-racking episodes of the day before. It is the uncertainty of things, not knowing one moment what terrible or wonderful thing is to transpire next, that lends so much fascination to a long motor trip.

At Sterling, Colo., I learned of a short-cut, a road not included in the Blue Book, yet considered a much better route to Denver than by way of Greeley. Incidentally, I learned to my sorrow that if one heeds all the good advice on road conditions and locations so easily given there is every chance that one may have occasion and time for regret. Before learning this lesson, however, to save 50 miles to me seemed sufficient argument, and I decided in favor of the shortcut.

Before leaving Sterling I discovered only a gallon of gasoline in my tank. Funds were awaiting me in Denver, but I did not feel equal to seeking a loan to see me through to this point. Estimating the amount on hand and the current cost of kerosene, I found my pocketbook would cover a sufficient amount of this commodity with which to make the next 100 miles.

Incidentally, my arrival at the Brown Palace, Denver, was followed closely by a volcanic trail of blue smoke sufficient to merit a just arrest within that city's limits, but instead I was greeted by a most courteous traffic official with a code of city regulations, suggesting that I "study them up" during my stay in Denver.

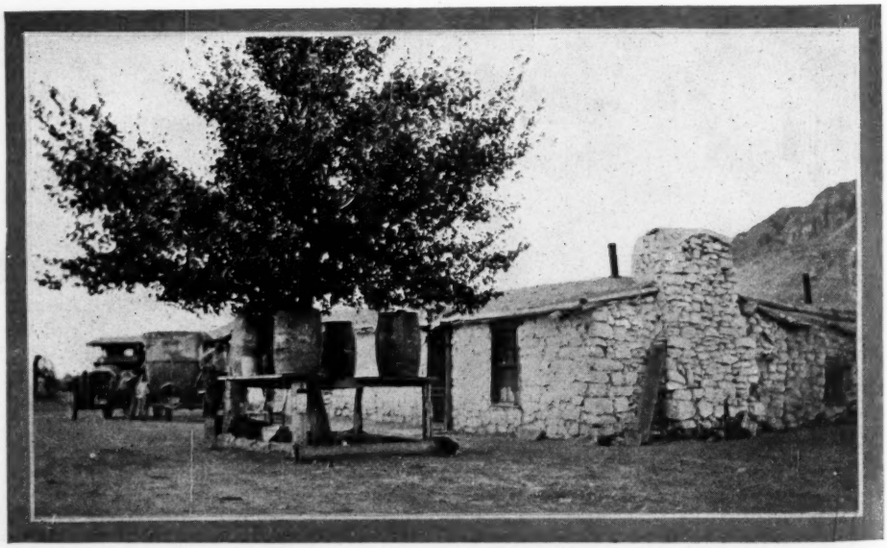
I left Sterling, as I learned when 10 miles out, on the wrong road and doubled back to make a fresh start. This road was fairly good for 20 miles or so, when I encountered a long stretch of dirt then under the process of being worked. A storm had come up suddenly, rain fell in torrents, mud in places was up to the hub, and I faced a steady climb into the higher altitude. This delightful driving continued until after dark, when I was compelled finally to stop by the roadside for the night, realizing the useless attempt to struggle on another 25 miles to the nearest town.

I always had been able to make a hotel for the night before, and this was my first sleeping out in my car with not another soul in the entire universe so far as I was concerned. Afraid? Why, yes, just a little. But with a rifle within easy reach and exhausted from a full day's drive my fears soon faded, and lulled by the distant howling of coyotes and the continuous patter of rain, I fell into a perfectly wonderful sleep. Never after this did I experience the least fear when sleeping out at night, which I soon learned to prefer to stuffy hotel rooms.

At noon the next day I arrived in Denver, where I remained a week. I took the gravel road north to Laramie, Wyo., by way of Fort Collins, and from Laramie I again took up the Lincoln highway, a good graded road for 58 miles to Medicine Bow, across miles and miles of prairies devoted mainly to stock raising. At Medicine Bow the highway changes from a graded to a natural dirt road, winding aimlessly across the desert, gradually ascending a long grade until at "91," as the Blue Book says, one has attained the summit of the continental divide. Then begins a long winding descent crossing the Devil's Backbone, and a few miles farther the Platte river and my destination for the day, Rawlins, Wyo.

A Course in Desert Travel

My run from Rawlins to Rock Springs proved more or less of a preparatory school in desert travel. Roads were fairly good, of natural dirt, but hilly and winding. There seems to be little if any habitation



Twenty miles of bad road with deep ruts led the car at last to Fish Springs and the adobe relic of frontier days

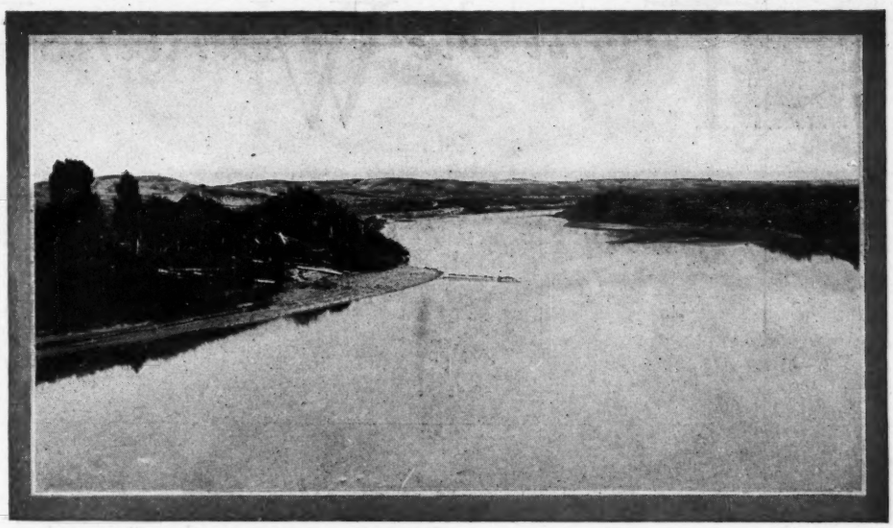
between towns, and it was necessary to carry ample water and gasoline. It is barren desert country, devoid of vegetation, with occasional water pools, around which the soil is a snow-white alkali, indicating an absence of animal life as well.

All one can see is that endless sand and dry leafless sage brush, with occasional hills of barren sand, the crests of which appear to have been flattened by human hand, like a table, all seemingly of a uniform height. No matter in which direction I looked my eyes were sure to recognize more than ever the wonderful accuracy in colors and detail with which Frederic Remington depicted America's vast plains and deserts, especially in Wyoming. These colors had no doubt much to do with the naming of the Red Desert.

While driving along happily, having been saved the annoyance of car trouble a few days, and estimating how quickly I should finish the day's schedule, I noticed a peculiar wabbling of a front wheel, spelling disaster to my joyous mood. Investigation revealed a broken cone, and I unfortunately carried no extra one with me. A fellow tourist came along directly and imparted the unhappy information that I was at that moment just about midway between the nearest garages, 55 miles to Rawlins and the same distance to Rock Springs. Spurred on by a realization of necessity, I sat down and stared the proposition into a solution, and for the benefit of my patient readers who may some day find themselves in a like predicament, I will explain how the difficulty was overcome.

Home-made Repairs

The hub cap was broken, the grease oozing out, and I had to tear the cap off piece by piece. The retainer was crumpled into a frightful mass, but this I proceeded to hammer into its original shape, replacing it over the bearing and tightening it with all my strength. I must confess that, finished, the job did not have the appearance of finesse, but I drove on and was able to reach Rock Springs and have the hub parts installed at a garage.



All that is desert is not desert if, for instance, a river such as Green river crosses the Red desert in Wyoming

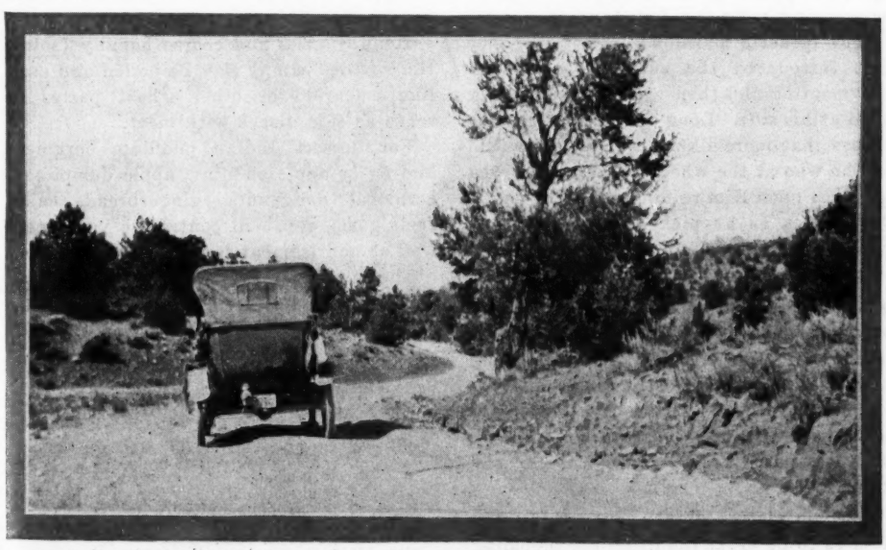
The next day registered a continuation of the Red desert for 100 miles, with natural dirt roads, very rough, hilly and winding, with few habitations between points, ideal conditions for trouble. Before this I had had the pleasure of repairing two punctures and a blowout. To be sure I had started my trip with several extra inner tubes and two spare casings on demountables, but I had acquired several punctures already, and my two spare tires and rims were lost, the holder having broken close to the body. This will explain the necessity of repairing my tires as occasion demanded, which was frequently.

Just where the Blue Book mentions "101.4, start long ascent," I began to note indications of the engine trying to stall. I managed, however, to coax it along over a mile of the grade before it stopped. Investigation followed, resulting in the discovery that the gasoline was too low in the tank for gravity-feed up the steep grade. Only another problem to be solved! Hitting on an idea, though not necessarily original, I managed to turn the car about and finish the grade of nearly a mile by reversing. I am quite sure had anyone seen me backing around curves and up that grade my sanity would have been questioned, but to reach the summit where a car could have room to pass was my aim, and this I accomplished. There I found three cars of tourists, all one happy party, who courteously volunteered to supply gasoline for me to reach Evanston, which I did at 7:30. I really should have remained there over night, but could not control my feverish desire to get into Salt Lake City, 83 miles farther, which I estimated I should do by 11 o'clock. I drove on, an act I have regretted ever since, as the night proved dark and I was unable to see the wonderful grandeur of the scenic canyon through which I passed.

The Aybss Blowout

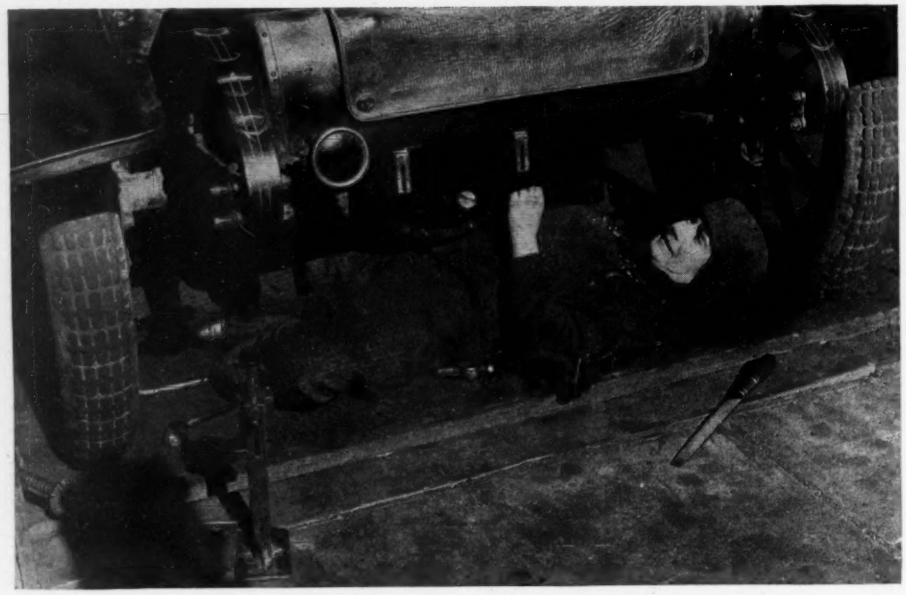
There had been a rain and the roads were muddy, winding up and down grades and dangerous. Somewhere near the summit, before descending into Parley's Canyon, I was greeted with that familiar and hated sound of a blowout. I was exceedingly tired, having driven all day over difficult roads, unable to get supper at any of the little towns passed, Coalville, Hoytsville and Wanship, as they "did not serve supper after eight o'clock." Added to all this the night was cold, and the blowout, of course, occurred on what seemed to be a ledge, too narrow for a car to pass me and not a fellow-soul within miles. The weirdness of it all prompted me to place a rifle alongside the tire tools, and with the aid of an electric lantern and 2 ft. of space to work on, mindful all the time of the depth of abyss at my side, I managed to get the tire repaired and was soon on my way with 20 miles before reaching the city. I arrived at 1 in the morning.

(Concluded next week)



The excellent, hard, smooth roads that approached Wellington, Nev., 175 miles northwest of Tonopah were welcome indeed

From the Woman's Viewpoint



Miss Lillian Johnson investigates the underside of a motor car

She Is a Machinist

MISS LILLIAN JOHNSON of Portland, Me., was born in Gottenberg, Sweden, twenty-one years ago. Formerly she was on the vaudeville stage, but her health gave out and she took up bookkeeping. This also proved too exacting, so she decided to learn the trade of a machinist. She now is a full-fledged machinist and has been employed as one for more than two years.

There is nothing mannish about Miss Johnson, those who know her say. She is a pretty, auburn-haired girl, 5 ft. 4 in. tall. She does all her own sewing, plays golf rather well, rides, plays tennis, swims and is, in short, an all-around athlete. Naturally she can drive a motor car, and just now she wants to join the aviation corps and help win the war.

Who Drives There?

SOME time ago the Philadelphia taxicab companies began to consider the plan of replacing men with women as fast as the men are called to the front. With the anticipation of the draft they have become even more certain in these plans, and the day when it is the woman to whom you entrust your life on the city boulevards seems very close.

The companies declare that as fast as the Government draft their men they will be replaced with women, though men still will be used for night work, temporarily at least. Several of the taxicab concerns are willing to turn their cars over to the Government in case they are needed; otherwise, business will be as usual, with women as drivers.

New York has boasted a woman taxicab driver for quite some time. Not so long ago MOTOR AGE ran a photograph of New York's only licensed woman taxicab driver. She drove a Ford and was quite a subject of interest through the novelty of her occupation. This will not be the case long, however. Already the voice of the woman laborer is becoming strong in the land, and extension to the motoring activities of the work world has commenced already. A mere trifle to extend these activities until they include the taxicab.

What is the world coming to? Does this mean a complete reversal of the old order of things, during which He it was who at the wheel of a high-powered car came upon Her plucking the flora by the wayside or romping with the fauna on the sward of her father's mansion? He it was who first introduced the surprised-to-see you conversation and then went away, the fair maid at his side. Long ago it came to such a pass that more likely than not it would be She who at the wheel of a high-powered car came upon Him ruining the shine on his worn shoes as he picked his weary way amid the dust and cinders of the beaten path.

What an argument for that anti-suffragist and anti-feminist who would have perpetual the old order of fair maidens whose only mission is to sweetly bloom and for whom the vote and wheel of a motor car bring hardships too great to be endured, must less permitted by those who can say otherwise!

Can you picture a fair young thing, too helpless to be other than like the blooming rose whose only mission is to sweetly bloom, making the 2:50 for a fare, while she cast sweet-scented odors on the air and looked with downcast eyes on the stranger to whom she rendered the sweet service? Answer, it can't be done. Gasoline and perfume don't mix.

Wheatless Meals

CORN, a great native breadstuff of this country, has not been used for human food nearly as much as its valuable nutritive qualities warrant. This is due largely to the fact that many persons with a wheat-using habit never have taken the pains to learn to use corn. There is no important dietetic difference between corn and wheat as sources of body fuel. Bread is convenient as a source of starch and protein, but in the ordinary mixed diet it makes little difference whether one gets the required cereal ration in the form of raised or light bread, mixed bread, or as mush, hominy, grits or desserts. For wheatless meals Government home economics experts suggest the following:

As a substitute for wheat breakfast foods, try white or yellow cornmeal or hominy grits served with cream and sugar, butter, sirup or fresh or dried fruit.

As a substitute for wheat biscuits, rolls or toast, the housewife can employ a dozen different forms of corn bread, such as hoe cake, dodgers, soft or spoon corn bread, hominy bread, cornmeal and rye Boston brown bread, Zuni Indian bread, etc.

Fried cornmeal mush, fried hominy or cornmeal pancakes, made with very little wheat flour, will be found a pleasing variation from wheat cakes.

Cornmeal codfish cakes, cornmeal scrapple, cornmeal croquettes, cornmeal or hominy cooked with meat, fish, cheese, eggs or milk will supply nourishing dishes for the hearty courses.

Hominy grits and coarse hominy (sometimes called samp) may be boiled and used like macaroni or other wheat pastes to serve as side dishes with meat.

For dessert Indian pudding, cornmeal and fig or apple pudding, apple dumplings, cornmeal doughnuts, gingerbread, cake, fruit gems, etc., will contribute variety as well as nourishment to the bill of fare.

The housewife who wishes to substitute corn for some but not all of the wheat flour can make excellent raised or light bread, pancakes, waffles, muffins, rolls, graham-flour Indian bread, etc.

Recipe for Spoon Bread

2 cups cornmeal
2 cups sour milk
2 tablespoons sugar, molasses or syrup
½ teaspoon salt
2 tablespoons butter
2 eggs
1 teaspoon soda

Mix all the dry ingredients together in a bowl, add the sour milk, eggs well beaten and the butter melted. Bake in a loaf for 35 min. or in muffins for 20 min. in moderate oven.

The Motor Car Repair Shop

Two-Wheel Trailer Running Gear

FOR the motorist who has a great deal of hauling to do, some form of two-wheel trailer is a valuable asset. It is not advisable to carry bulky articles in the tonneau of a passenger car, for in many instances the upholstery has to suffer for it, or some other form of damage is likely. Camping parties will find that a trailer will take care of the proper transportation of baggage, tents, stoves, tent poles, etc., without in the least inconveniencing the occupants of the car which has the trailer in tow. In many cases a carpenter is called out into the country to do construction work on a farm, and if he is the owner of a car, the chances are he will use it for transporting building material and lumber to his work. If he finds it necessary to carry a few extra men with him in the car, riding will be anything but convenient. For such men the construction of a trailer is a decided advantage.

Diagram of Trailer Chassis

In the accompanying illustration is shown a trailer running gear to be used in connection with a Ford car. This gear is for a two-wheel trailer, the axle of which is taken from an old car. Usually a second-hand front axle can be picked up together with the wheels, but some means must be provided to hold the wheels of the trailer in a straight line.

If the car to which the trailer is to be attached is a Ford it will be necessary to build a supporting bracket as shown at A to fit on the rear of the car under the spring clips. This bracket can be made out of steel about $\frac{5}{16}$ in. thick and 1½ in. wide. It is heated to a red heat and then bent into the shape of a horseshoe, as shown. Holes are drilled in it at the ends for the spring clip shanks and another hole drilled in the center of the loop for the pin which connects the trailer to the car. When it is desired to disconnect the trailer, it is only necessary to take out the bolt. Thus the bracket A remains a permanent fixture on the car.

To prevent the wheels of the trailer from turning, two braces are made out of steel as shown and twisted so that one end of them will lay flat in the channel of the axle. Holes are drilled in these braces for a bolt to the spindle arm and two bolts which hold the braces to the axle proper. The latter holes should be so placed on the axle that they can also be used in attaching the diagonal braces running from the axle to the bar which is fastened to the loop A. The latter bar, as well as the diagonal braces can be made of ⅜ in. steel about 1½ in. wide. On the center bar a small length of the same steel is attached to make a fork which rides on the loop A. The holes bored in this fork should be the same diameter as that in A, in order that the pin will fit properly.

As shown in the illustration, the holes in the axle in which the spring perches were formerly placed are not used in bracing the running gear. This is done so that they may be utilized in attaching the trailer body. Inasmuch as the builder will have to determine what particular style of body he wants, the mounting of the latter on the trailer gear will have to be left to his ingenuity. As a general thing, however, the old spring perches might be used to which could be fastened a frame made of pipe fittings and several lengths of pipe. On this frame the body itself could be made out of wood, preferably ash.

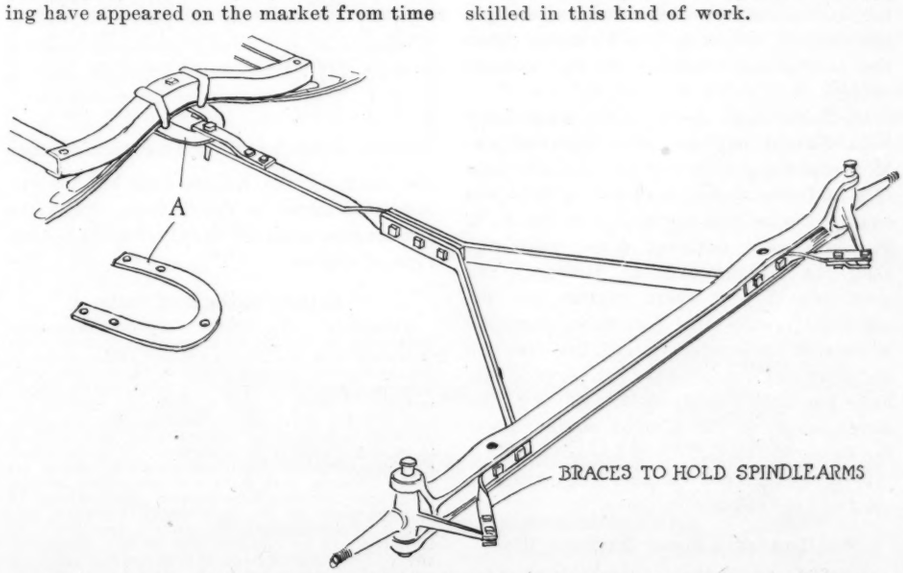
By using a Ford front axle and spindles it is, of course, possible to use the regular front wheels. In this way the trailer wheels can be adjusted by the cones on the spindles the same as on the car itself. Another feature of using the same wheels on the trailer is that tires, which have done service on the car and are still in fairly good shape, can be used on the trailer. Also it will not be necessary to carry different sizes of tubes, inasmuch as the latter will fit both car and trailer.

Soldering Aluminum

Now that aluminum is so extensively used in motor car construction it is well to know how to solder this material. Various compounds for carrying out this soldering have appeared on the market from time to time but much of the operation depends upon the skill of the worker. The greatest difficulty in soldering aluminum is that the heat is absorbed so rapidly that it cools the soldering iron. Another difficulty is that aluminum oxidizes instantly upon exposure to the air, this thin film preventing a perfect union of the two surfaces. One way to overcome the latter is to have the parts well heated and the melted solder kept hot while the iron stands on it. Then the surface can be scraped beneath the melted solder with the point of the iron. In this way it is possible to tin the metal.

Sometimes zinc is used but usually this does not form a strong joint. Another substance that can be used is tin, which is stronger than zinc, but much more difficult to manipulate. If a small portion of phospher-tin is added to the pure tin it works easier. In fact, the latter combination is the basis of some of the aluminum solder now on the market.

The parts to be joined should, needless to say, be well cleaned by scraping, or by dipping into a solution of nitric acid in hot water. The latter solution is made by mixing the acid with three times its bulk of hot water into which has been added a little commercial hydro-fluoric acid. The solution will have a chemical action on the metal and the latter should be dried in hot sawdust after the acid bath. A formula which can be used for uniting aluminum parts can be made out of the following: cadmium, 10 parts; zinc, 10 parts; tin, 10 parts; lead, 1 part. This formula, however, should only be used by those who are skilled in this kind of work.



Trailer running gear, showing method of attaching it to the rear of the car and braces to hold the steering arms rigid

The Readers' Clearing House

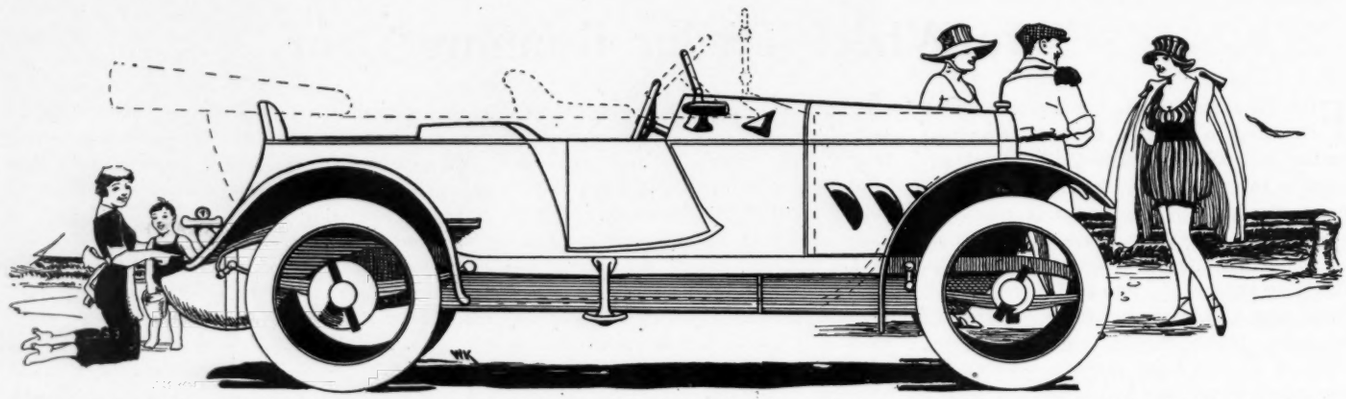


Fig. 1—Suggestion for a reconstructed 1913 Jeffery, showing straight line effect and absence of running board. A step is used in place of the latter

QUERIES ABOUT KNIGHT ENGINE

Development Confined Chiefly to Pleasure Car Service

TILLAR, Ark.—Editor MOTOR AGE—What are the advantage and disadvantages of the Knight type of engine?

2—Why are there no Knight motor racing cars?

3—Explain the reason for the abnormal number of valves on the tires of the Hudson Super-Six racing special published in your May 10 issue.—Burton C. Terry.

1—Among the advantages of the Knight type of engine may be mentioned quiet running, positive action of the valves, due to the fact that they are mechanically operated by means of connecting rods from eccentrics placed on the camshaft and what carbon is deposited on the walls of the combustion chambers is said to be beneficial in that it helps to seal the passages of the combustion chamber. This type of engine also does away with the unpleasant operation of valve grinding, necessary with the poppet type of valve. Also when the ports, cut in the sleeves come into line the gas is passed directly into the combustion chamber, and in the same way the burnt charges are carried out in a direct manner from the combustion chamber to the exhaust valve.

2—There have been racing cars fitted with Knight engines. For instance, the Mercedes-Knight driven in the 500 mile race at Indianapolis by Pilette in 1913 was equipped with this engine. Also the F. R. P. racing cars, designed a few years ago used the Knight engine. Probably the chief reason why these engines are not more universally used for racing purposes, is because their development has been directed chiefly for pleasure car service. Nobody has as yet confined themselves to the development of the Knight engine solely for speed creations.

3—These are not valves. They are lugs used to hold the tire in place.

Per Cent of L-Head Engines, Etc.

Fairfield, Iowa—Editor MOTOR AGE—Give the relative percent of T-head, L-type and valve-in-head motors used in motor cars.—B.

Records show that out of one-hundred and thirty-three different cars made in this country, ninety-four use the L-head type of engine. Next in order comes the valve-in-head type, represented by eighteen makes, while the T-head engine comes last, being used by five makers. Some of the manufacturers who employ the L-head engine also equip some of their cars with any one of the other types as the case may be.

Communications Received and Inquiries Answered

Burton C. Terry	Tillar, Ark.
B.	Fairfield, Iowa
Nemo	Abingdon, Ill.
Walter Reese	Newton, Kas.
A. J. Marquess	Washington, D. C.
Guy C. Johnson	Cedar Rapids, Iowa
Jerome Kayser	Brooklyn, N. Y.
G. B. D.	Calgary, Alberta
A. Burmeister	Cleveland, Ohio
R. C. Stone	Keene, N. H.
A. Jones	Beauxite, Ariz.
J. C. Mason	Wheeler, Ill.
Graham & Handel	Mt. Carrol, Ill.
T. C. Bass	Sherman, Texas
A. L. Silverson	Moose Jaw, Sask.
A. E. Huxhold	Denver, Colo.
Reeves Price	Mt. Pleasant, Iowa
I. C. Mitchell	Greensburg, Ind.
I. C. Havens	Montreal, Can.
G. P. Magraw	Pierson, Iowa
T. C. Kelly	Alberta, Okla.

For example, the Empire four has its cylinders arranged in the T form, while the two Empire sixes are fitted with the L-head type of engine.

Battery Instead of Cells

Abingdon, Ill.—Editor MOTOR AGE—My Overland model 79, 1914 car is equipped with Splitdorf low tension magneto and coil, with dry batteries for starting. The electric system is Gray & Davis two unit, with single wiring. I wish to use my storage battery on the coil for starting instead of the dry cells, as I do not care to keep buying dry cells if it is not absolutely necessary. I understand this change has been successfully made on these models, but I do not have the wiring diagrams showing the proper connections. Is it necessary to put resistance between coil and storage battery to protect the coil? Is it necessary to change any of the wiring to the coil on account of the grounded lighting system? I do not care to make any change that would burn out the coil or create a short that would ruin the storage battery. I think there is a proper way to make the connections.—Nemo.

The Willys-Overland Co. advises against the use of the storage battery for operating the Splitdorf ignition system, as the storage battery voltage is too high and will injure the coil in short order. Of course by inserting a resistance in the coil circuit you could decrease the effective electro motive force. It would require some experimenting to find the proper amount of resistance. One of the terminals on the coil marked Batt. or B. would have to be grounded and the other connected to the terminal of the storage battery which is not grounded.

Speedster Body for Jeffery

Newton, Kan.—Editor MOTOR AGE—Show design of a low speedster body for a five-passenger Jeffery 4, 1913-14 chassis.—Walter Reese.

This is shown in Fig. 1.

Rebuilding Overland for Speed

Nemaha, Ia.—Editor MOTOR AGE—Publish diagram for converting my 1913 model 71 Overland into a speedster with exhaust pipe on outside. Want to use the fenders if possible.

2—About what speed would this car attain with a 3½ to 1 gear ratio and timed faster? It will do 55 m.p.h. with five-passenger body and 3¾ to 1 gear. The car has no starter.—A. J. Marquess.

1—This car converted into a speedster of attractive lines is shown in Fig. 3.

2—It is impossible to give a definite answer to a question like this, because so many things have to be taken into consideration. According to what your car can do with its present equipment, you ought to be able to attain a speed of from 60 to about 70 m.p.h. with the higher ratio and the engine properly adjusted for speed.

Double to Single Wire System

Washington, D. C.—Editor MOTOR AGE—My Chevrolet 1914 Baby Grand has a double wire lighting system and grounded ignition. How can I change the lighting to a grounded system?

2—Why do the lights get brighter when I speed up my motor?—F. S. Pohanka.

1—In order to change the wiring from the double wire or insulated return system

to the single wire or ground return system, you ground one side of the battery and one side of every lamp. The side grounded must not be the one in which the switch is located. By grounding the battery and the lamps is meant that you remove one of the wires connected to the lamp or battery, and to the terminal from which the wires are removed you connect a short wire the other end of which is connected to some bright spot of the engine or frame of the car.

2—The reason that your lights get brighter when you speed up your motor is that your generator is not perfectly self-regulating, so that its electro motive force increases with its speed, which, of course, is proportional to the engine speed.

HIS CAR LACKS POWER ON HILLS

Method of Timing Valves and Ignition on Abbott-Detroit

Cedar Rapids, Ia.—Editor MOTOR AGE—My car is an Abbott Detroit, five-passenger, model K, four-cylinder, bore 4⅛. When I run the car at a good speed the engine works all right, but when we slow down and try to start up again it chokes up and kills the engine, or jerks the machine. Is that carbureter trouble?
2—Is the Zenith carbureter a good one?
3—Give a diagram showing the wiring of the ignition on the 1915 or 1914 fall car, of Abbott Detroit.
4—What kind of ignition equipment has this car at the present time?
5—Who can inform me how to time this type of engine?
6—Since overhauling the car we are unable to climb up a small grade on high.
7—How can I determine the horsepower of the engine?—Guy C. Johnson.

1—In all probability, yes.

2—Yes.

3—This is shown in Fig. 2.

4—The Remy system.

5—If you wish to set the camshaft proceed as follows: Assume that the engine is in position on the chassis with the radiator and timing gear case cover removed, and camshaft installed with cam and crankshaft gears attached to their respective shafts. Open the pet cocks on top of the cylinders so you can turn the engine over easily. Turn the engine over slowly and place the finger on pet cock No. 1 and observe when the piston of this cylinder has reached the top dead center of its compression stroke. Now remove the cap on top of the flywheel housing and you will find that the center line of No. 1 and 4 on the flywheel rim coincides with a line drawn across the center of the housing. This line on the housing we will call the center line. If a small mirror is held at the proper angle behind the opening in the housing, the lines may be easily seen. Next turn the flywheel over 2$\frac{15}{64}$ in. At this point you will find a line marked 1-4. It indicates the point where the No. 1 intake valve should begin to open. Have this mark line up accurately with the center line on the housing and then rotate the camshaft to the right until the No. 1 intake valve lifter begins to bind. As soon as the cam has pressed the lifter against the valve stem hard enough to barely permit rolling the lifter between the thumb and finger, slide the idler gear into place

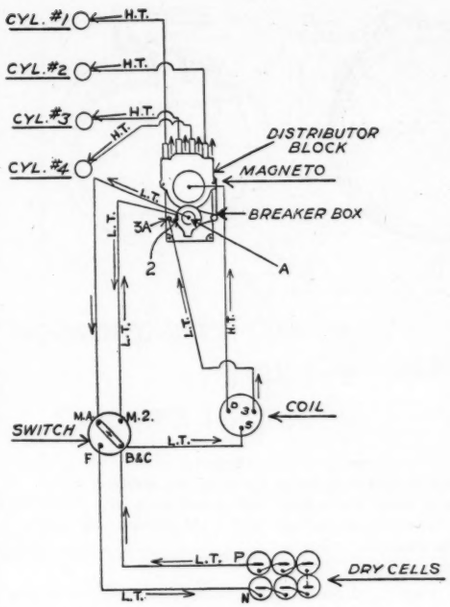


Fig. 2—Ignition layout used on model K Abbott-Detroit

on its shaft. The cam and crankshaft will then be properly timed.

To set the magneto, crank the engine over to dead center and continue the revolution until the flywheel dead center line is ½ in. past the crank case center line. Uncouple the two halves of the magneto adjusting flange, remove the distributer block and the brass cap which covers the breaker box. Now rotate the magneto shaft until the brass segment on the distributer disk is 45 deg. past the bottom point of the disk, or approximately opposite the small oil hole. Next set the magneto at full retard by raising the breaker box lever, which connects with the spark control lever, as far as it will go. With the breaker box at full retard the points should start to open for cylinder No. 1 just as the brass segment reaches 45 deg. past the center and has made contact with the brush that leads to the terminal of spark plug wire No. 1. With the magneto in this position, the points just starting to break, clamp both halves of the adjusting flange together. The engine and magneto will then be properly timed.

6—This is probably caused for one thing by the valves being out of time.

7—The S. A. E. horsepower formula as usually stated is:

$$\text{Horsepower equals } \frac{D^2N}{2.5}$$

Where D is the bore of the engine in inches and N the number of cylinders.

Thus an engine 4⅛ by 5¼ in. with four cylinders would have the following horsepower:

$$\frac{4\frac{1}{8}\times 4\frac{1}{8}\times 4}{2.5} \quad \frac{68.06}{2.5} \quad 27.2 \text{ horsepower}$$

The above formula is applied at 1000 feet per minute of piston travel.

HOW THE CAR BRAKES OPERATE

Generally Work on Drums Attached to Rear Wheels

Brooklyn N. Y.—Editor MOTOR AGE—Where could I get a line on the present system of braking for cars? I am an amateur and would like to have the principles explained thoroughly.—Jerome Kayser.

Undoubtedly everyone is familiar with the common form of horse-drawn vehicle brake in which the brake shoes bear directly on the steel tires of the wagon wheels. If such shoes were similarly placed on a motor car fitted with rubber tires, it is very obvious that the latter would be worn out altogether too quickly. Therefore the brakes of a motor car are of a different type. On account of the weight of an automobile the brakes must be very powerful in order that the car may be stopped very quickly if necessary. The majority of cars carry the brakes on the rear wheels, the latter being fitted with drums for this purpose and called conventionally, brake drums. Some cars are built with a brake on the driveshaft, the theory being that the drum can be made smaller on account of the reduction gears in the rear axle drive. This means that if a car so equipped is geared 4 to 1, only one-fourth of the braking effort is necessary to stop the car. In other words you would have to press the brake pedal four times as hard, if the brakes are on the rear wheels. An additional function of the brakes on a car is to allow it to be held on the side of a hill when desired, generally accomplished by setting the emergency brake.

Nearly all cars are fitted with two sets of brakes, one called the service brake and the other the emergency brake. The

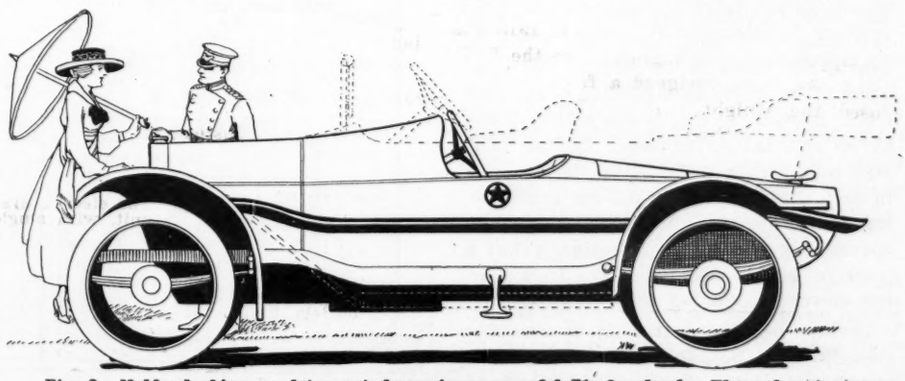


Fig. 3—Nobby looking roadster cut down from a model 71 Overland. The exhaust pipe is on the outside

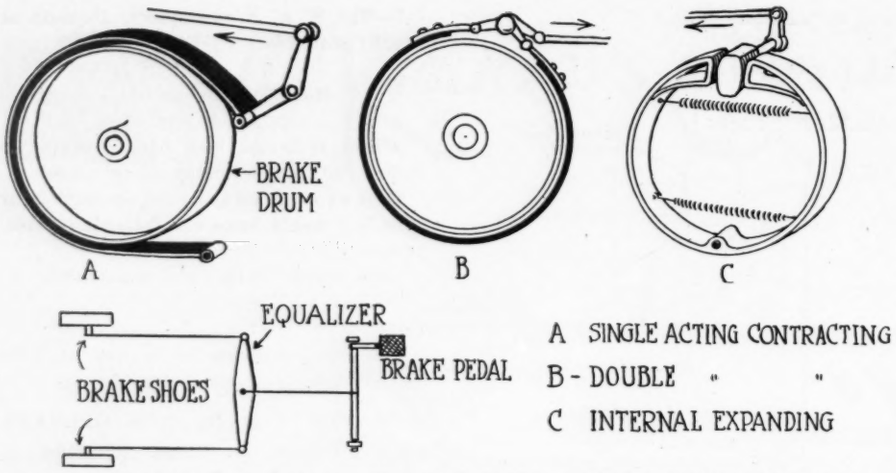


Fig. 4—Diagrams to show the operation of the braking systems as used on modern cars. The single-acting, contracting band brake is not used nowadays and most cars are fitted with both the double-acting contracting and internal-expanding brake, operating on the same drum placed on the rear wheels

service brake is applied by pressure on a foot pedal and is the brake most used, owing to its convenience of operation. The other, the emergency brake, is operated usually by a lever placed alongside of the gear-shifting lever. This brake is seldom used while running. Generally it is applied when the car is left standing, in order to prevent its rolling down an incline. Sometimes, however, it becomes necessary to stop the car short, to avoid collision, etc., and in this case the emergency brake, as its name indicates, is quickly applied.

When the brakes are fitted to the rear wheels, they act on steel drums attached to the spokes or hubs. The brake shoe which is used to bear against the surface of this drum is made to either act on the inside or outside of the drum. When it acts on the outside of the drum it is spoken of as a contracting type of brake, inasmuch as the band surrounding the drum is contracted to a smaller diameter in order to grip the drum. When on the inside, it is called an internal expanding type of brake. The external contracting band is a flexible band of steel faced with an asbestos composition to resist wear and heat when the brakes are applied. The illustration shows an internal expanding form of brake. When the lever to which the cam, shown at the top, is pulled, the cam is turned sideways, forcing the shoe apart and finally against the inside surface of the drum. On most cars both types of brakes are made to operate on the same drum. The single acting brake is not used much nowadays, the double-acting brake shown at C taking its place. On this form both of the ends are attached to the lever in such a manner that when one end is being pulled in one direction the other is operated in the reverse direction. Thus a powerful grip is obtained on the drum slowing down or stopping the ear altogether.

In any braking system it is essential that the pull be the same on each rear wheel brake, otherwise the car would have a tendency to skid and act contrary to the way it should. For this reason brakes are fitted with equalizers, used, as their name implies, to equalize the pull on each brake. By referring to the illustration you will see how this is carried out. There are other forms of equalizers also, but the one shown will serve to illustrate the theory of the system.

ELECTRIC SYSTEMS ON CHEVROLET

Not Advisable to Place Gasoline Tank on Rear

Calgary, Alberta—Editor MOTOR AGE—Give complete circuits of starting and lighting; also ignition systems on Chevrolet 490.

2—Where will I tap a dash lamp so as to take current through ammeter?

3—What is the best method of focusing lights on above model (the brackets are bent)?

4—Would changing the headlights to 21 c.p. nitrogen bulbs be too much on the battery if used sparingly?

5—Give sketch and method for hanging gasoline tank on the rear of Chevrolet car. I would like to shorten manifold and use the vacuum system. Do you think it would be an improvement to have the tank of larger capacity than the present one—road clearance not to be lessened?

6—What is the average mileage obtained per gallon with the above car?

7—What type of Willard battery is used?—G. B. D.

1—These are shown in Fig. 6.

2—One side of the spotlight circuit must be connected to that side of the ammeter away from the battery, when you trace the circuit from the battery. The other side of the spotlight circuit must be connected to the opposite side of the main line either at the battery or at the junction block.

3—About the only thing you can do to bring the lamps into proper focus on the road is to straighten the brackets so that the lamps will be in the proper position. You can determine this by running the car up to within about 10 or 12 ft. from the wall on the inside of the garage at night and see if the spots of light on the wall are the same diameter and have their diameters on a common horizontal line. Some drivers, however, prefer to have their lights focused so that one light will throw a trifle ahead of the other. This makes it possible to see objects close to the front of the car and yet have a light far enough ahead to drive by.

4—If they are sparingly used they may be too severe on the battery, otherwise it is not advisable to use them.

5—We are inclined to think that you would be going to a lot of trouble if you attempted to place the tank on the rear of the car as you mention. In the first place the car is fitted with cantilever springs and it would be quite an undertaking to fit brackets to hold the tank in place on account of the frame construction. The present system of feeding the gasoline on this car is simple and apparently quite efficient to do the work. We therefore do not think that the net results of fitting the equipment you mention will warrant the expense.

6—According to the Chicago agency of the Chevrolet, this is from 24 to 25 miles on a gallon of gasoline.

7—The battery is a Prest-O-Lite 6-volt 80-amp.

Wiring on 1915 Maxwell

Cleveland, O.—Editor MOTOR AGE—Give wiring diagram for model 15 Maxwell touring car.

2—I have just purchased a new storage battery, but only receive dimmer lights and no bright headlights. Where do I make connections for spotlight?—A. Burmeister.

1—This is shown in Fig. 5.

2—Look for loose connections in the switch terminals, or to grounds somewhere in the line. Also see that the new battery

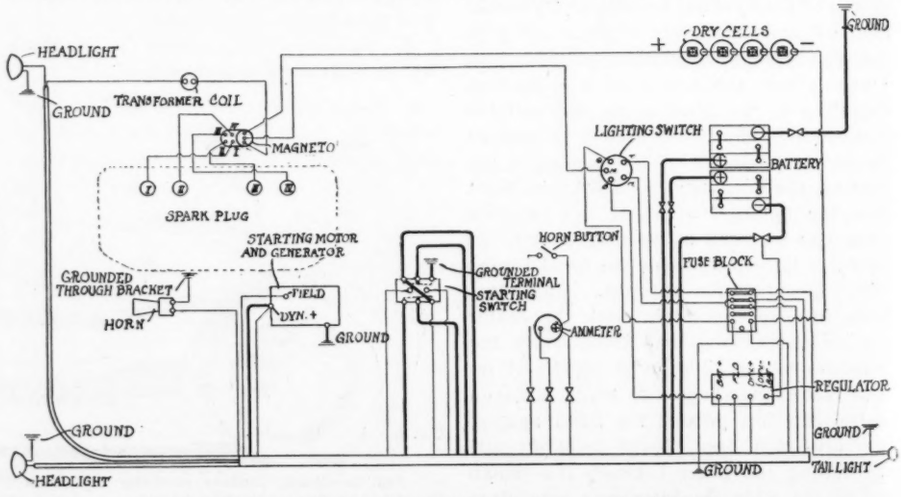


Fig. 5—Wiring of lights and ignition as used on the 1915 Maxwell

is of the right size and sufficiently charged.

To connect a spotlight to the model 15 Maxwell you have to remove the cover from the regulator box under the seat. Connect one of the wires from the spotlight to the terminal marked Batt. Plus and the other wire from the spotlight to ground.

RE-TIMING A FOUR-CYLINDER REO

Flywheel Marked to Correspond with Crank Position

Keene, N. H.—Editor MOTOR AGE—What is the correct way to time a motor? I drive a 1916, four cylinder Reo.—R. C. Stone.

You do not state whether you wish to time the valve action or the ignition. If the engine has been taken apart for any reason, or fails to deliver its usual amount of power, it is well to go over the valve setting, checking it up in the following manner.

You will find that the flywheel has upon its face the marks U.D.C., 1 and 4 meaning the upper dead center of the cylinders 1 and 4. Also the marks U.D.C., 2 and 3 meaning the upper dead center of the cylinders 2 and 3. In addition there is the mark E.C., meaning exhaust valve closes. Since the cranks for 1 and 4 and 2 and 3 are exactly 180 deg. apart, or on opposite sides of the center, the marks on the flywheel face, which serve for cylinder No. 1 will also serve for No. 4. Similarly the marks for 2 will serve for 3.

To check the valve setting, open the relief valves of the cylinders to make the engine turn easily. Taking any cylinder, as No. 1, crank the engine slowly until the exhaust valve of this cylinder lifts and

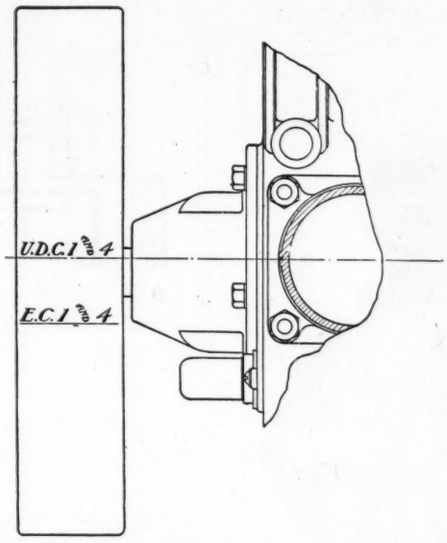


Fig. 7—Marks on the flywheel for timing a 1916 Reo

starts to drop again. Still turning the engine slowly, determine the exact point where the exhaust valve is completely closed. This is best determined by turning the valve spring seat which will turn the valve stem until the moment of closing, when the friction of the valve on its seat will prevent the turning of the stem. At this moment, the mark E.C. on the flywheel should not be more than ½ in. either way from the reference point on cylinder No. 4 which is a small prick punch mark located on the side of No. 4 cylinder next to the dash. If this checks for one cylinder, the others will be all right as the cams on the camshaft are in correct relation to each other.

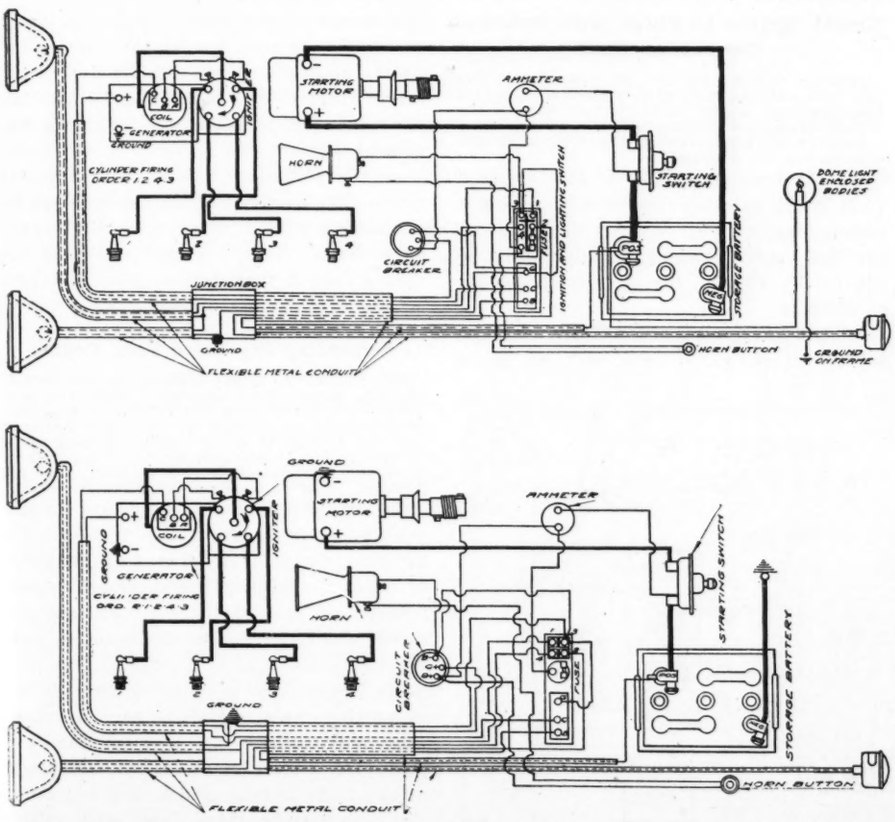


Fig. 6—Wiring diagrams of the Chevrolet 490. Above is shown the two-wire system, while below is the single or grounded return system

Old Model Hudson Inquiries

Bauxite, Ark.—Editor MOTOR AGE—What model is a Hudson 20, No. 2403?

2—What kind of oiling system has it and do you use oil or grease in timing gear case?

3—This motor has good compression, but lets too much oil work up past the rings. Will it stop a certain amount of oil if I bore three holes in the bottom of ring groove on each piston and then file a groove on the bottom side of ring to correspond with each hole?

4—Give diagram of this model (chassis only) with gas tank fastened at rear end so I can use the Stewart vacuum system, and how it might appear as a speedster.

5—What is the gear ratio of this model in high gear?—A Jones.

1—1910.

2—This car was fitted with a splash system of oiling, the oil in the engine lubricating the timing gears also.

3—In all probabilities the pistons and cylinder are worn to such an extent that they allow the oil to get past them and into the combustion chamber of the engine. Reboring and fitting larger sized pistons would be the remedy, you might help matters by making the change you speak of.

4—Various suggestions for this have appeared from time to time in these columns and you can in all probability work out something for this car from a study of illustrations which have been published.

5—According to the Chicago representatives of this car, this was about 4 to 1.

Poor or Variable Contact

Wheeler, Ill.—Editor MOTOR AGE—The Auto-Lite generator on my Overland 83 does not generate any current. I tightened the springs on the brushes a little and it worked for a few days and then quit. The brushes are not worn out and the armature is perfectly smooth. It generates when I press on both brushes but the hand on the ammeter does not show a steady charge; it moves back and forth at same engine speed. What is the trouble?—J. C. Mason.

The symptoms mentioned by you show that there is a poor or variable contact either between the brushes and the commutator or between the brushes and the brushholders. This may be due to dirt on the contact surfaces, to looseness, insufficient pressure, etc.

Recipe for Frosting Lamps

Mt. Carroll, Ill.—Editor MOTOR AGE—Furnish a recipe for frosting headlights to kill the glare.—Graham & Handel.

Lamp frosting may be done quite cheaply and conveniently. You can either frost the bulbs themselves or the lenses of the lamp and the process is carried out in the following manner: Two ounces of sandarac, ½ ounce of mastic, 22 ounces of ether and 16 ounces of benzine are made into a solution. The mastic and sandarac should be ground together and mixed with the solution of benzine and ether. The lamps should be dipped in the solution, which is best contained in a deep bowl.

Steering Gear Binds at Times

Sherman, Tex.—Editor MOTOR AGE—I have a Haynes 6, model 36 car a little more than a year old and have had considerable trouble with the steering gear. It gets so tight at times that it is really painful to drive. What can be done to loosen the steering gear?—T. C. Bass.

It is hard to suggest a remedy for the strange behavior of your steering gear

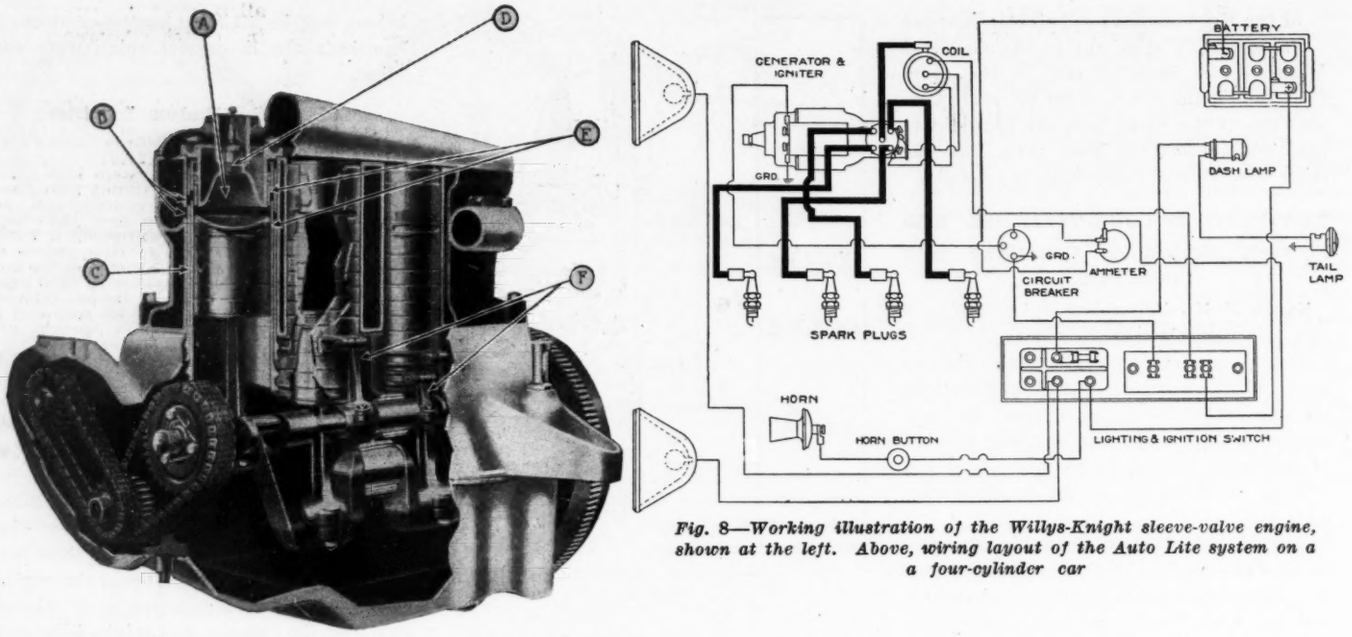


Fig. 8—Working illustration of the Willys-Knight sleeve-valve engine, shown at the left. Above, wiring layout of the Auto Lite system on a four-cylinder car

without seeing or driving the car. Perhaps the binding is caused by lack of lubrication somewhere, or it may be that something has worked loose in the steering gear housing and causes the gears to jam at times. About the only thing we can suggest is to take the gear apart for careful inspection. A good mechanic should be able to look over the steering aparatus and adjust it for you in case you are not familiar with the work yourself.

Wiring for Auto-Lite Generator

Moose Jaw, Sask.—Editor MOTOR AGE—Publish a wiring diagram for a four-cylinder car using an Auto Lite generator type DG, cutout, ammeter, two headlights, dash and tail lights, horn and Connecticut type G ignition. I would prefer the head lamps dimmed by placing them in series, and the dash and tail in series all the time. What equipment such as fuses and switches will be necessary?
2—What size of battery would be most suitable?
3—Will the magneto shaft be fast enough for this generator?—A. Lorne Silverson.

A wiring diagram for an Auto Lite generator operating headlights, dash and tail lamps on a four-cylinder car is shown in Fig. 8. All of the necessary parts such as lighting and ignition switch, circuit breaker, ammeter, etc., can be obtained from the Auto-Lite Co. It is possible that this concern also furnishes a dimming switch connecting the two headlights in parallel for regular running and in series for running with dim lights. However, you can use an ordinary double pole, double throw knife switch for this purpose. The connections are then made as shown in Fig. 11.

2—A 100-amp. hr. battery will be suitable for this generator.

3—The generator should be operated at magneto speed.

DIMENSIONS OF WILLYS ENGINES

Knight Engine Is Fitted with Spherical Combustion Head

Denver, Colo.—Editor MOTOR AGE—Give the bore, stroke and piston displacement of the Overland model 75-B engine; also of the Willys-Knight 4 engine.
2—Give working view of the Willys-Knight engine.—A. E. Huxhold.

1—The bore and stroke of the Overland 75-B is 3⅜ by 5 in. respectively, giving a piston displacement of 178.9 in. That of the Willy's Knight four cylinder engine is 4⅛ in. by 4½ in., giving a displacement of 240.5 in.

2—A working view of the Willy's Knight engine is shown in Fig. 8. At A is shown the spherical combustion chamber and B shows the ports or openings through which the gas is taken in and expelled. When the ports come into register they form an opening through which the gas passes from the manifold directly to the combustion chamber, or, in case of the exhaust ports, from the combustion chamber to the manifold. The sleeve valves C glide up and down between the piston and the cylinder wall, their surfaces being covered with oil. As shown the spark plug is placed in the center of the cylinder head. Thus the point of ignition is directly above the center of the piston. Compression in this engine is held, not by the sleeves, but by the usual piston rings and a similar but larger ring in the cylinder head. The latter marked E, is called the junk ring and presses against the surface of the inner sleeve in the same manner as the piston rings. The sleeve valves C are operated by connecting rods F from eccentrics placed on a shaft. No springs are used and the timing cannot vary, inasmuch as the valve action is positively driven.

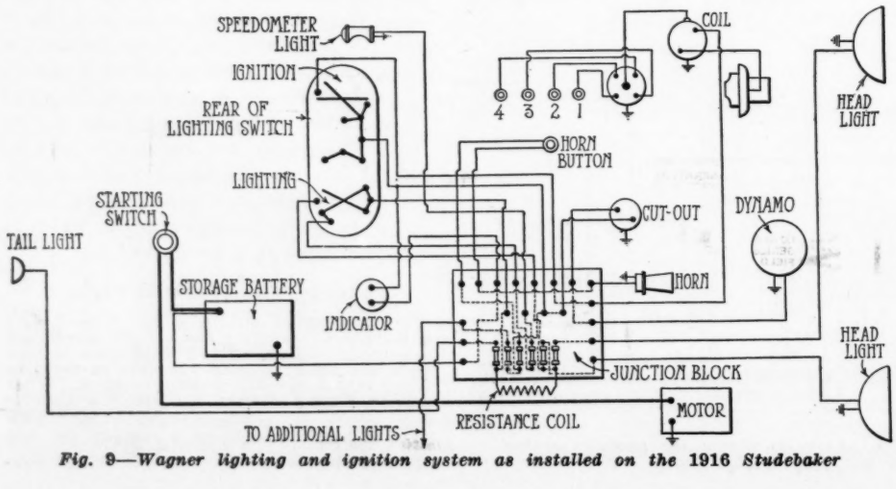


Fig. 9—Wagner lighting and ignition system as installed on the 1916 Studebaker

Suspending Car Cover From Ceiling

Mt. Pleasant, Iowa—Editor MOTOR AGE—Show a sketch of a convenient method to suspend a car cover from the ceiling of a garage where there is only 18 in. of space between the top (when it is up) and the ceiling. I would prefer to have it so that it could be held up without interfering with the car passing in or out.—Reeves Price.

In Fig. 10 is shown a suggestion for suspending a cover from the rafters of a building in such a way that it can be rolled up when not in use, thus allowing free entrance and exit of the car. Pulleys and screw eyes are placed as shown in the rafters and the top of the cover can be held in its proper position by tying knots in the supporting ropes, which in turn are fastened to the screw eyes. The sides and end pieces of the cover are fitted with light poles at the bottom which will aid materially in letting them down and rolling them up snugly. Straps can be fitted at

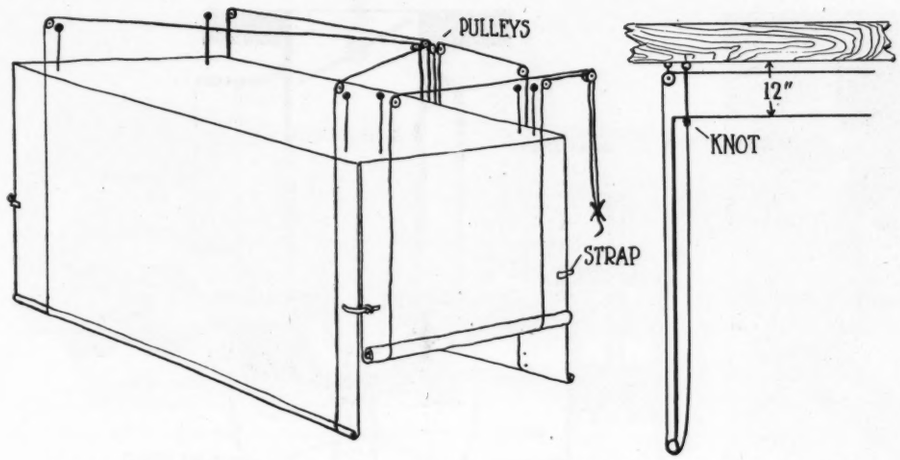


Fig. 10—Suggestions for making and controlling an adjustable canvas cover to protect the car

the corners, if desired, or some of the different forms of curtain fasteners, such as used on side curtains, to hold the sides and ends together.

HEADLIGHTS POOR ON 1914 MARION

Probable that the Lights Are Not Properly Focused

Greensburg, Ind.—Editor MOTOR AGE—The headlights on my 1914 Marion are very poor. Have tried new nitrogen lamps, but they all give a dim light. I keep my storage up in good shape. What can I do to improve the lighting system?

2—When my engine runs idle there is a loud knocking noise, which seems to be in the front part of the engine. This is not noticeable when running 15 m.p.h. or more. I have ground the valves, removed the carbon and tightened the connecting rods without avail. What is the trouble?

3—My transmission will not hold oil very long. I am using No. 600 W, but it seems to work out through the torsion tube sleeve yoke near the universal joint. What is the reason?—I. Carl Mitchell.

1—If you have bulbs of the right voltage and the storage battery is in the proper condition the only thing that can be wrong is that the lamps are not properly focused. If adjusting means are provided try to bring the bulbs into focus by them.

2—Such a knock can be caused by loose bearings or worn timing gears. An improperly fitting piston, causing side slap will also knock violently sometimes at low engine speeds.

3—Loss of oil through leakage at any point along the drive shaft tube can generally be traced to worn felt washers, gaskets or to wear in the metal itself of the different parts. Sometimes an application of shellac at the point of leakage will add materially in preventing the oil from coming out.

Front Cylinders Foul on Six

Pierson, Iowa—Editor MOTOR AGE—I note your reply in the June 14 issue to the inquiry of Clarence L. Nickerson concerning his Chalmers 6-30. I have the same trouble. All the cylinders register 60 lbs.; all seem to get a good spark, have had the valves reseated; tappets properly adjusted, but while the three rear plugs run clean and do perfect work, the three front ones run foul and miss. Your suggested remedy will not work—that is to "use heavier oil"; besides, the full battery of cylinders gets the same oil. My machine does not seem to get too much oil but does seem to get too rich a mixture of gasoline in front only. How can this be corrected? There is only one short lead from carbureter to cylinder block.—G. P. McGraw.

We believe that if you installed one of the oxygen-generator devices on the market, much, if not all of the trouble you are having with the front set of cylinders getting too rich a mixture will be overcome. Owing to the fact that the front cylinders are somewhat lower than the rear, it is possible that some of the unvaporized gasoline will mix with the oil and eventually foul the plugs. Hence by supplying extra oxygen to these cylinders it is likely that better combustion will result.

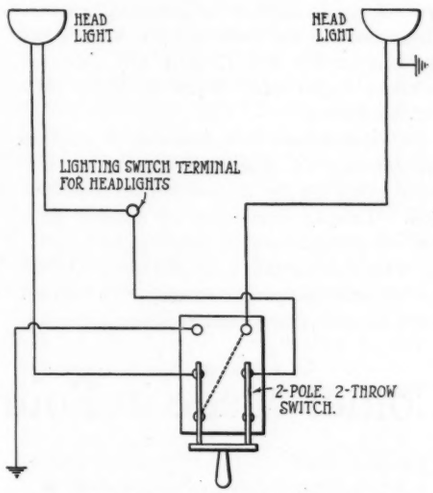


Fig. 11—Using a double-pole, double throw knife switch for dimming

Ammeter on Genemotor

Montreal, Can.—Editor MOTOR AGE—Publish wiring diagrams for the following cars: Hudson 6, 1917 model, Chevrolet 1917 and Studebaker.

2—How can I connect an ammeter on a Ford using the Genemotor with starting switch on the top of the motor?

3—On the Chevrolet, should the lighting wire be connected on the battery terminal or at the starting switch on the side nearest to the battery; in other words, ahead of the starting switch?—I. C. Havens.

1—These are shown in Figs. 12, 6 and 9.

2—In order to connect an ammeter in circuit it is necessary to remove the switch from the motor. The ammeter with its two wires takes the place of the jumper wire connecting the starter switch and the cutout.

3—You can connect the lighting wire at either point—it will not affect the operation of the system.

Using Ford Parts on Metz

Alberta, Okla.—Editor MOTOR AGE—I wish to convert my Metz car into a gear-driven car. Can I use a Ford crankcase?

2—If so, can I use the transmission and rear axle.—T. C. Kelly.

1-2—Nothing is impossible so far as changing the mechanical units of a car is concerned, but it is a question whether or not it is worth while to do so, when you take into consideration the time and expense of the operation. Also the results, sometimes are the reverse of what was expected. Cars are essentially designed as units and any taking away or adding to the mechanical equipment is apt to throw the rest of the design into disorder. When you look at a Ford crankcase and then at the Metz engine, you can easily see that you will have quite a lot of work on trying to fit the former, to say nothing of the transmission and rear axle. We do not think it advisable to make the change.

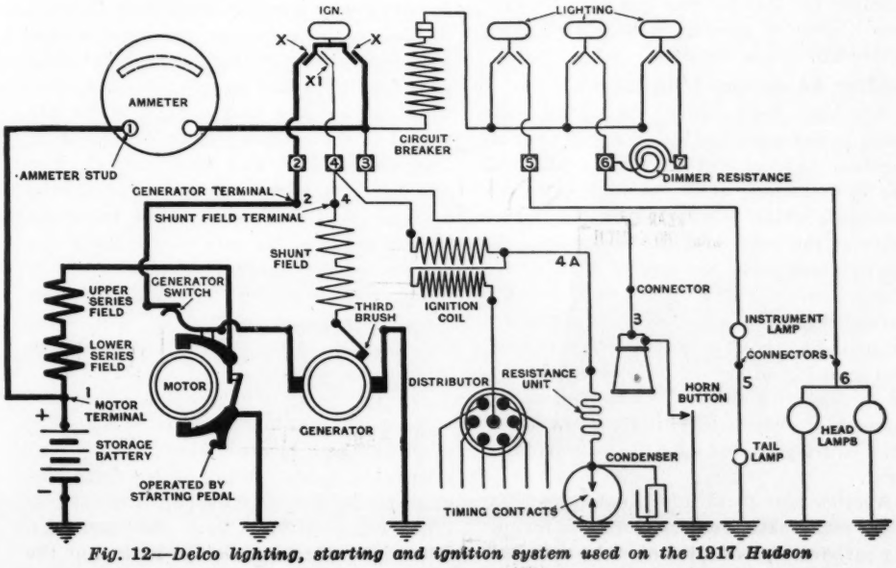
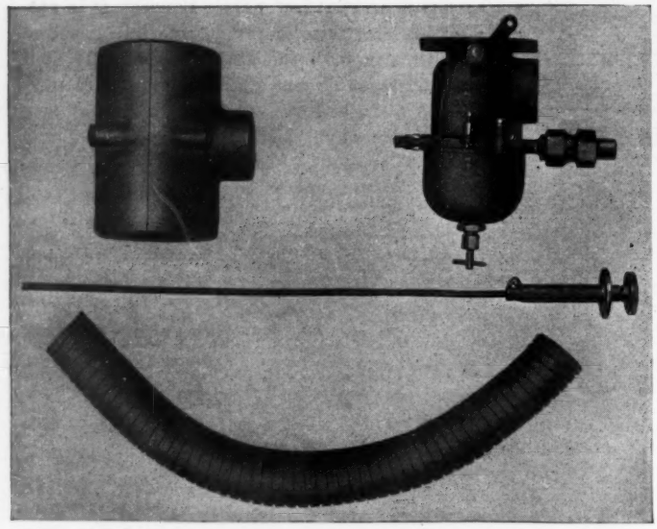
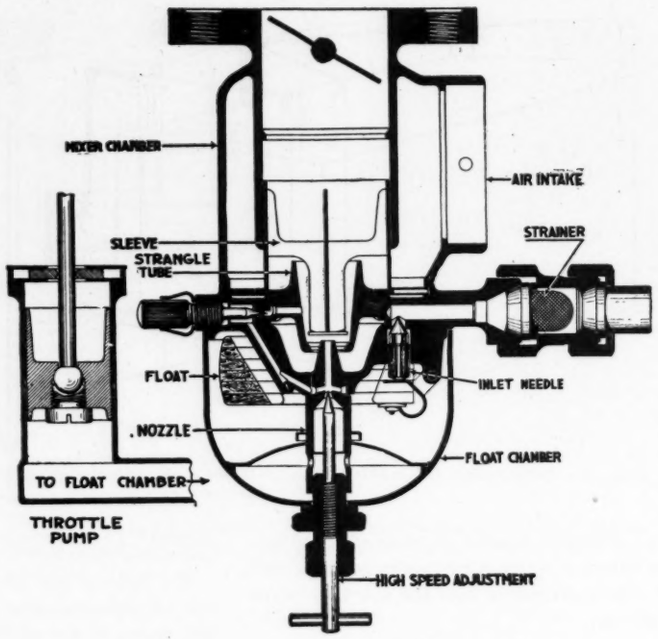


Fig. 12—Delco lighting, starting and ignition system used on the 1917 Hudson





Johnson carburcter, showing stove, hot air pipe and dash control for Studebaker, Overland, Maxwell and Oakland cars. At right, sectional view

Johnson Carbureter Has Single Jet

IMPROVEMENTS have been made in the new Johnson carbureter to give a cleaner idling. In general principal the carbureter which is manufactured by the Johnson Co., Detroit, is the same as the previous design. It is a gravity air-valve type with a single concentric jet, in which the air-valve is made up of a sleeve rising and falling by suction and gravity in the cylindrical passage above the jet.

Improvement has been made by removing the idling passage from the space at the throttle and placing it in the strangle tube where the vacuum is considerably higher. In the Johnson carbureter there are three stages of vacuum, one is the space between the throttle and strangle tube, the second in the strangle tube itself and the third in the space below the plate on the bottom of the air valve sleeve. By removing the location of the idling adjustment, the flow of gasoline for this purpose has been brought into a zone of greater vacuum and hence better idling has resulted.

Folding Adjustment Independent

Another effect which the change has made is to render the idling adjustment altogether independent as far as practical use is concerned, from the high-speed adjustment, which is effected by the needle valve at the bottom of the carbureter. In the previous model the flow of gasoline for idling was controlled by the needle at the bottom with the adjustment being solely for air. The result was that frequently the best possible idling adjustment could not be secured with the desired high-speed adjustment. This is a difficulty which has been entirely removed by the new arrangement.

Another new feature of the Johnson line is the manufacture of complete sets including carbureter, stove, hot-air tube and dash control for a number of standard models. These include the Overland 79, 80, 81, and 83, Studebaker 16, 17 and 18, series 4; Oakland Light Six; Maxwell 1915, 1916, 1917 and Ford.

On carbureters intended for V engines the Johnson Co. fits a throttle pump giving a quick supply of gasoline for acceleration. This is controlled by means of a vertical plunger, which operates in a cylinder adjacent to the float chamber. When the throttle is open the plunger is pressed down forcing the gasoline through the jet. This gives the necessary rich mixture for quick acceleration. There is no difference in the working parts of the carbureters with and without the throttle pump. There is a change, however, in construction in that the float bowl is a stamping on the standard model while on the model with the throttle pump the cylinder holding the plunger and the float bowl are cast together, and a baffle plate is soldered in the float bowl. This baffle plate is for the purpose of directing the gasoline from the throttle pump to the jet.

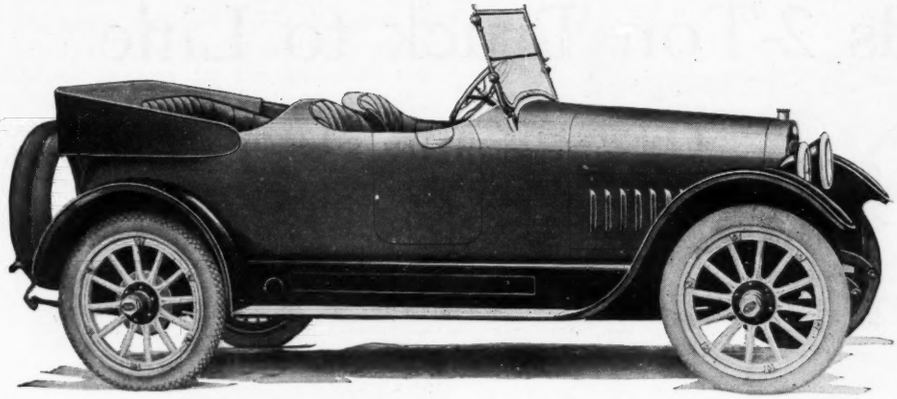
Comet Made in Four and Five Passenger

PRODUCTION of the Comet cars, made by the Comet Automobile Co., Decatur, Ill., is well under way, according to recent statements by the concern. The Comet company was formerly located in Chicago, but in seeking a factory site chose central Illinois as being better adapted for shipping facilities, thus escaping the congested conditions of the larger cities. The personnel of the company includes George W. Jagers, president and treasurer; G. Vernon Beck, vice-president and general sales manager; and William M. Lewis, secretary. The assembly of the cars is now being carried on in the temporary building of the company until the first unit of the new factory is ready for occupancy. This building will be 150 by 600 ft. and of modern fire-proof construction.

The engine of the Comet is a six and and has a 3½ in. bore and 5 in. stroke. The cylinder block is an L-head casting with removable head. Oiling is by force-feed and splash, the oil pump, of the plunger type, being driven from the camshaft. There is a splash pan in the bottom of the crankcase, with troughs for the connecting rods to dip in. Holes are drilled in the pistons to prevent the oil from passing by the rings. There are also holes drilled in the wrist-pin bosses for proper oiling of the wrist pin. All the engine bearings are die-cast. The valves are of Tungsten steel, while the cam and crankshafts, as well as the connecting rods are of drop-forged steel. Cooling is by pump circulation in connection with a cellular type radiator. The flywheel is inclosed with a bell-type housing. The starting and lighting system is the Dyneto two-unit outfit. The starting motor is fitted with the Bendix drive to the flywheel. Ignition is by the Delco system.

In unit with the engine is a three-speed selective gearset. The clutch is of the dry-plate type with nine plates. The latter are steel and raybestos-lined. The gear control lever is placed in the center together with the emergency brake lever, in the conventional manner. Two universals take the drive through a hollow propeller shaft.

The front axle is of the I-beam type,



Lines of the new Empire four-passenger six. Note the smart angle of the windshield

with Elliott knuckles. A full-floating rear axle is used, the gear ratio of which is 4½ to 1. Hyatt roller bearings are used throughout with a ball thrust bearing back of the pinion and ring gear. The differential is a Brown-Lipe, fitted with spiral gears. The axle housing is of malleable iron, while the gears and drive shafts are nickel steel. Brakes are conventionally placed on the rear wheel drums which are 12 in. in diameter.

Following universal practice the frame is made of pressed-steel, with a kick-up over the rear axle. Wood wheels are fitted and these carry tires 33 by 4 in. Demountable rims are used. Wire wheels are optional. The steering gear is irreversible with worm and gear, ball thrust bearings and left hand mounting. The steering wheel itself is 18 in. in diameter and fitted with a corrugated rim. Hand control levers for the spark and throttle are placed above the wheel. The horn button is placed directly in the top center of the steering wheel.

Two types of bodies, using the same chassis, are fitted, consisting of a five-passenger touring car and a four-passenger chummy roadster. The former has a rear seat 48 in. wide. Equipment consist of headlight, tail-light, trouble lamp, cowl-light and spot light in the lighting equipment. A one-man top is included, with Jiffy side curtains. On the instrument board is a Stewart-Warner speedometer, ammeter and carbureter dash control. A 6-volt 110 amp. storage battery is mounted on the chassis, while a 20-gal. gasoline tank is placed on the rear of the car. Gasoline feed is by a Stewart-Warner vacuum-tank. The usual kit of tools, jack, etc., is furnished also. A spare rim is carried on the rear of the car and comes as regular equipment.

New Empire Six

FOLLOWING the recent announcement of a new series of fours and sixes, the Empire Automobile Co., Indianapolis, Ind., states that it has added a new four-passenger, six-cylinder touring car to its line, designated as model 71. This model is fitted with a high narrow racing type of radiator, sloping hood, stagged windshield, deep front cowl and dividing front seats which gracefully blend into a double cowl effect.

Another feature of the new car is the roominess in both the front and rear compartments, especially the latter, there being ample room for two grown persons without cramping them. A large storage compartment is entered through the back of the rear seat, providing plenty of carrying space for touring. The body has a clean-cut taper from the back of the front seats to the extreme rear of the car.

As in all other six-cylinder Empire models, model 71 is equipped with a Continental engine with which is incorporated a selective type transmission and clutch, making it a unit powerplant. The chassis of the new car is practically the same as that of the touring car. Model 71 is finished in what is called an Empire brown, with cream colored wheels. Wire wheels can be had in place of the conventional wood wheels at an additional charge. The price, $1285, is the same as that of the Empire five-passenger touring car.

REPUBLIC TO CONTROL KNIGHT?

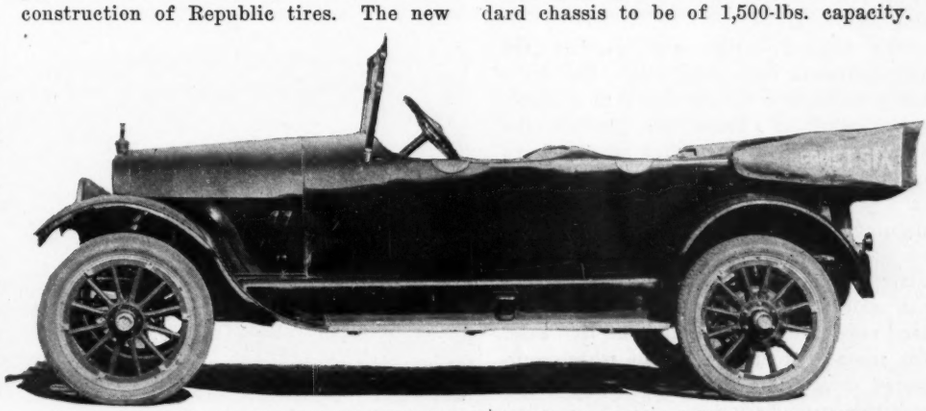
Youngstown, Ohio, July 14—The Republic Rubber Co., Youngstown, Ohio, has acquired an option in the controlling interest in the Knight Tire & Rubber Co., of Canton, Ohio, which is held by Thomas L. Robinson, Guy E. Norwood and John T. Harrington. Plans are for a new corporation with a capital of $20,000,000. The Knight factory is to be greatly enlarged and in part will be immediately devoted to the construction of Republic tires. The new capital is to be expended for increasing pneumatic tire capacity at Youngstown and Canton, for very large increase in the truck tire capacity of Youngstown, and for considerable increases in the molded goods department of the Republic plant.

No official statement is yet obtainable as to the price to be paid by the new corporation to Youngstown and Canton stockholders but it is understood that the transaction will be very attractive to all stockholders. As soon as the option is fully exercised Mr. Norwood will also assume immediate charge of the Knight factory.

H. J. Woodward, general sales manager of the Knight Tire & Rubber Co., has been made general sales manager of the Republic Rubber Co. C. W. Hardin, formerly vice president of the Republic Rubber Co. of New York is now mechanical sales manager at Youngstown. M. E. Murray, formerly assistant general sales manager at Youngstown now becomes manager of the Chicago branch of the Republic company. Mark W. Roe, formerly with the McGraw Rubber Co., now becomes consulting engineer for Republic. The Republic Rubber Co. business in June was the largest in its history. It is expected that the sales volume of the new corporation will be $18,000,000 a year.

DUPLEX LOOKING FOR HOME

Clintonville, Wis., July 16—Final plans are being made by the Wisconsin Duplex Auto Co., recently organized at Clintonville, Wis., with a capital stock of $500,000, for the establishment of its premanent works. A number of cities in Wisconsin are making strong bids for the industry, among these being Appleton, Wis., where the Rotary club is backing the movement. No decision has been made, but it is the intention of the new concern to get work under way before fall. W. A. Besserdich, president and chief engineer of the Wisconsin Duplex Auto Co., was one of the founders of the Four Wheel Drive Co., Clintonville, now a $1,000,000 concern, from which he retired recently to develop and market several new patents on transmission systems for motor vehicles. The new company is to build passenger cars in addition to light delivery trucks, the standard chassis to be of 1,500-lbs. capacity.



Side view of the Comet, which is fitted with a six-cylinder engine of 3½-in bore and 5-in. stroke

Stewart Adds 2-Ton Truck to Line

Oil-less Bearings Used in the Springs and Counter-Shafts

Side view of the Stewart truck, giving a good idea of its sturdy construction

PURSUING its policy of enlarging its truck line to include a complete range of vehicle capacities, the Stewart Motor Corp. of Buffalo has added a 2-ton chassis to its line, known as Model 7. Previous to this year, the Stewart company followed a policy of building a single light delivery model, but this year, finding that the demands of dealers were for a complete line of trucks, the range of models has been expanded, until there are now four including the 2-ton. These are of 1,500 lb., 1-ton, 1½-ton and 2-ton capacities.

The new 2-ton truck follows along conservative lines of design, but has some features which are distinctive. One of these is the reduction in the number of grease cups used to nine on account of the wide use of oil-less bearings. The oil-less bearings are used throughout in the springs, spring shackles, brake counter shafts, and wherever possible to use this type of bearing. This is the Nigrum bearing, made by the Bound Brook Oil-less Bearing Co.

The truck is assembled from standard units, the engine being a Buda having a bore and stroke of 4⅛ by 5½ in. This engine is an L-head four, with water circulation. It has a Berling magneto and the carbureter is 1¼ in. Zenith, equipped with an engine driven governor. The radiator is an armored tubular type, with a false front having cast top, bottom and side members.

The engine, clutch and gearbox are mounted as a unit powerplant, the drive being through a Fuller clutch to a three-speed gearbox. From the gearbox the drive is through a three-joint tubular drive shaft with a center joint support mounted on a cross member and supported by self-aligning ball bearings. from the rear member of the drive shaft the torque is transmitted to a Celfor internal gear driven rear axle. The load carrying member, or dead rear axle, is set behind the live axle. The second reduction is at the wheels supported directly by the wheels and located near their peripheries.

Both the drive and torque are taken through the rear springs. These, as stated, are bushed with oilless bearings and are 54 in. long and 3 in. wide. The front springs are 41 in. long and 2½ in. wide. The wheels are 34 in. and of the artillery type, having semi-round spokes.

The tire equipment is 34 by 4 in. Swinehart pressed-on type for the front, and 34 by 7 in. solid pressed-on type rear. At an extra cost of $25 4 in. dual rears are provided. The wheelbase is 156 in.

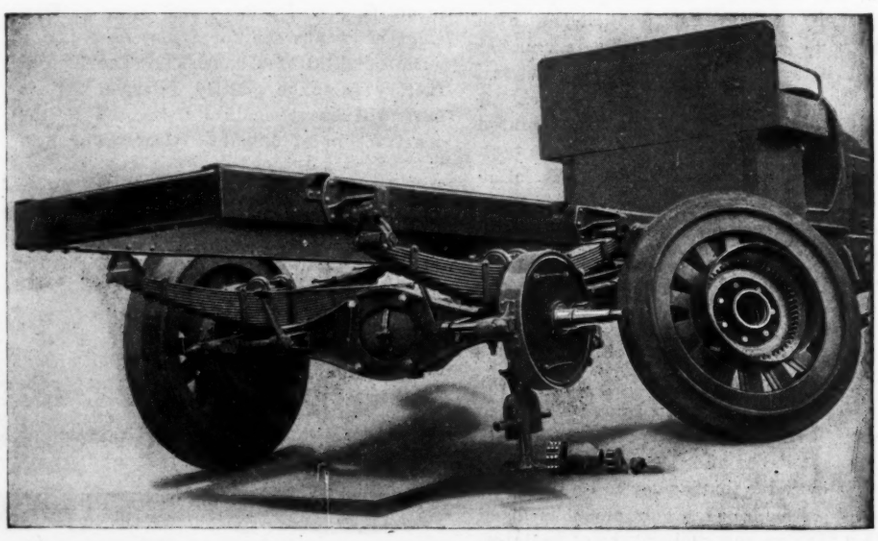
This capacity of the truck is capable of a wide variety of uses, and this particular chassis model is suitable for 10, 11, or 12 ft. bodies. It is completely equipped with front bumper, two side and one rear oil lamps, tool kit, tool box on running board, mechanical horn, driver's seat, 16-gal. capacity gasoline tank, and pressed steel fenders. It sells for $1,975 f. o. b. Buffalo in lead and $20 extra painted.

New Hudson Truck Axle

A new worm-driven truck axle has been announced by the Hudson Motor Axle Co., Philadelphia, Pa., a new concern headed by William F. Hudson who brought out the Hudford truck forming unit.

Practically speaking the housing of this axle is merely a support for the parts which really mount and hold the gears. Projecting lugs are fastened to the inside of the cover plates on the differential housing, and these lugs are so placed that those on one plate will fit into those of the other when in place on the axle. These lugs form the seats for the differential bearings. Four bolts pass through these lugs holding the whole as a unit. All of the driving effort is taken by the supporting members. By thus mounting the gears it becomes a matter of but little labor to change the gear ratio if this should be desirable. The usual ratios for this axle are 7¼, 8 or 8¾ to 1.

Following universal practice the worm is placed above the worm wheel. The latter is made of bronze, while the worm itself is of chrome nickel steel. Ball bearings are used for the support of the differential and combined radial and thrust ball bearings for the worm shaft. The wheels are mounted on tapered roller bearings. The axle is full floating, the road



Rear view of the Stewart truck, showing the mechanism of the internal gear drive

wheels being mounted on dead axle tubes. The spring seats are placed on top of the axle tube. The housing is a steel casting, trussed properly for strength. The complete weight of the axle is 575 lbs. It is intended to be used for trucks of 1½ ton capacity.

Bell Has Two Models

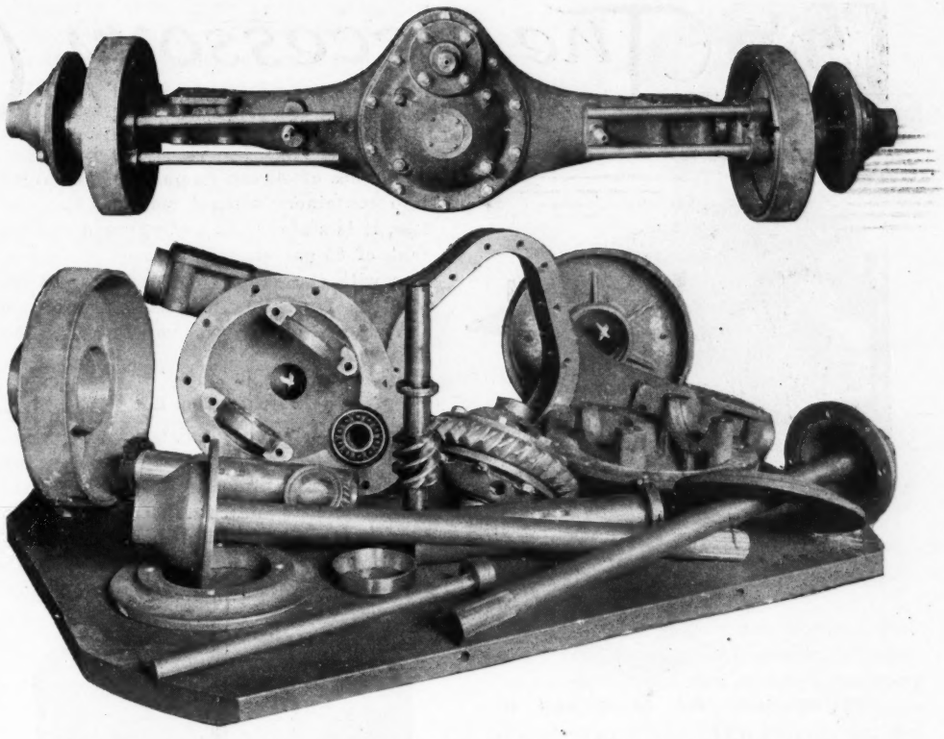
Four-Passenger Roadster and Five-Passenger Touring on Same Chassis

A FOUR-PASSENGER roadster and five-passenger touring car using the same chassis, has been brought out by the Bell Motor Car Co., York, Pa. The engine is rated at 35 hp., the cylinders having a bore and stroke of 3½ and 5 in. respectively. Cylinders are conventionally cast in block with detachable head.

The frame is made of 4½ in. deep channel pressed steel, with the upper half of the rear spring bracket integral. There are three cross members, including a front member under the radiator. The front axle is an I-beam, while the rear is floating, with an inspection plate at the rear. Annular bearings are fitted. The car has a wheelbase of 112 in. and the tread is standard. A thread-screw type of Lavigne steering gear is fitted, which is irreversible and adjustable for wear. Wood wheels of the artillery type are used, shod with tires 31 by 4 in. Brakes are external contracting for service and internal expanding for emergency.

Lubrication is taken care of by a constant-level splash system, with plunger pump operated from an eccentric on the camshaft. Valves are 1⅝ in. in diameter, with 45 deg. seats. There is a 1⅞ in. free gas opening with a mushroom type lifter, hardened and ground. The crankshaft is made of carbon-steel alloy, drop-forged and balanced. The camshaft is 1 in. diameter. Ignition is by the Atwater Kent system and carburetion is taken care of by a Zenith carbureter. The thermo-syphon system of cooling is used.

In unit with the engine is a Covert transmission giving three speeds forward and one reverse. The gears are nickel-steel as well as the shafts. The clutch is an 8 in. Borg and Beck. The Bell company is using the Dyneto two-unit system in combination with a Bendix drive and Willard storage battery. The steering gear is on the left, affording the conventional form of center control. The price of the five-passenger Bell is $875.



Hudson truck axle with part of the brake rigging removed to show housing, and below, dissembled parts of the Hudson axle showing the bearing supports in the cover plates

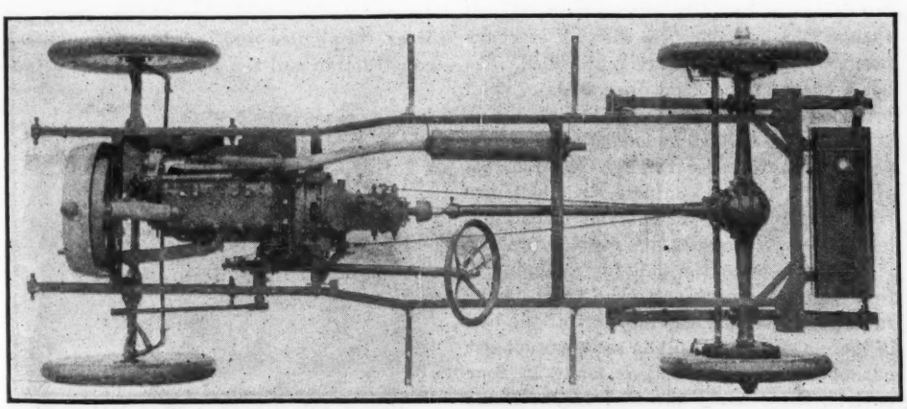
Van Keuren Engine Simple

THE Van Keuren mono-valve engine is said to be the first and only overhead rotary-valve type to eliminate the principal objection to this type, namely the inability to cool and lubricate the valve properly. This objection is overcome by free circulation of the cooling water through the entire length of the valve barrel.

A single valve of the rotary type controls all functions of the engine. This revolves at half the speed of the crankshaft and is driven by a chrome-nickle steel roller chain. There is an adjustable sprocket on an additional drive shaft used for the magneto. This sprocket with its adjustable feature, is used to maintain the proper tension of the chain.

The particular claims are, of course, simplicity and elimination of a great number of parts; the makers claim that this figure totals over 100. Cheaper material and machining cost and inexpensive maintenance are features which one will take for granted after studying the construction. Another advantage is that there is equal performance of the valves at all speeds, when compared with the poppet-valve construction in which it is said that the springs will not permit the valves to follow the cams perfectly at high speeds.

The engine as now built has a 3-in. bore and 5-in. stroke. The diameter of the valve barrel is 2¼ in. This valve is lubricated by mixing oil with the gasoline, which is said to keep it effectively coated at all times. About 1 pt. of oil is mixed with 5 gal. of gasoline.

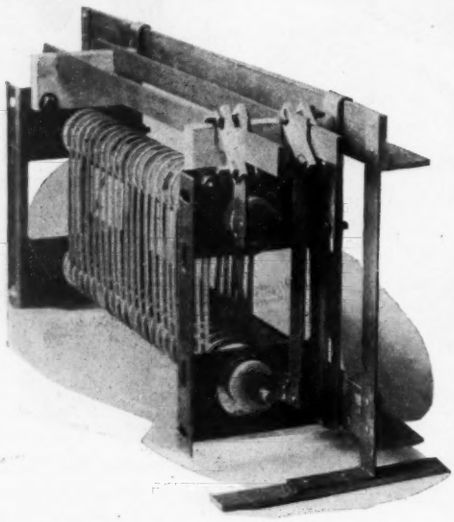


Chassis view of the new Bell Four which has a 112-in. wheelbase

CORRECTION

In the July 5 issue of MOTOR AGE, reference was made to the Burd piston ring directory in which the statement was made that this directory sells for 50 cents. The Burd High Compression Ring Co., Rockford, Ill., calls our attention to the fact that the directory is free to dealers and that this charge is made only to private individuals.

The Accessory Corner



Westinghouse heater to be used in enameling

Westinghouse Heater for Enameling Ovens

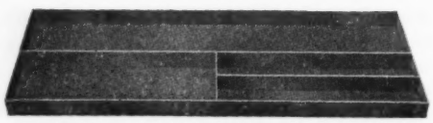
THE Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa., announces a new electric oven heater adapted for heating ovens for enameling and japaning. The heating element consists of a ribbon wound on a number of fireclay bushings which are assembled on two steel rods extending between pressed steel end plates. The ends of the ribbon have terminals secured to them, these terminals being clamped to the tie rods, so that the rods become the terminals for the heater. The rods are insulated from the end plates and their ends are threaded to receive the connectors. Hooks are provided to hang the heaters to the usual supporting steel work, the hooks being bolted to the flanged end plates of the heaters. Protecting screens may be attached to the flanged end plates. The heaters may be mounted either on the side walls or the floor of the oven, and any number may be placed in an oven. They are normally rated at 2.5 kw. at 120 volts, and may be supplied for both direct and alternating current, single phase or poly phase, of 110, 220, or 440 volts.

Wayne Curb Oil Pump

This new device is a curb lubricating pump manufactured by the Wayne Oil Tank & Pump Co., Fort Wayne, Ind., and is finished in dark green enamel, lettered in gold. The housing is cylindrical in form, the bottom part of which slides up and locks. The entire lower part of the housing is hung on counterbalanced weights, making it very easy to handle. The pump stands 54 in. in height and is 16¼ in. in diameter. Half pints, pints and quarts are delivered by push button stops located in the head of the pump. Accurate quantities of oil can be quickly discharged into containers without spillage, dirt and loss, it is stated. An underground storage tank of 65 gal. capacity is used in connection with the pump. The tank buried below the frost line makes it possible to store the oil at an even temperature all the year round.

Peerless Tool Kit

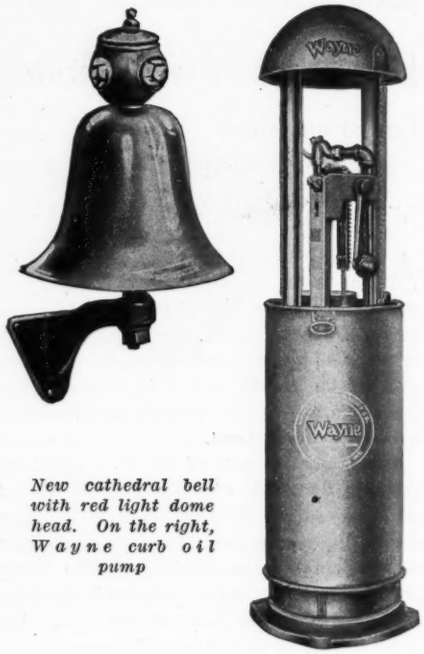
This is a steel box finished in black enamel and designed to be fastened on the running board. The box measures 22 in. long, 9 in. wide and 7 in. deep. One of the chief features is the fitting of a wooden tray to the inside of the kit which is divided into several compartments for holding small parts. In this way such parts as tire valve cores, spark plugs, etc., can be conveniently kept without having to search through the entire kit. This feature also makes the kit especially adapted for mechanics, carpenters, etc. Two strong clasps are provided and in addition to these the box has a lock and handle for lifting the lid. The price is $2.50. The Corcoran Mfg. Co., Cincinnati, Ohio.



Peerless tool kit, showing removable wooden tray

Cathedral Bell

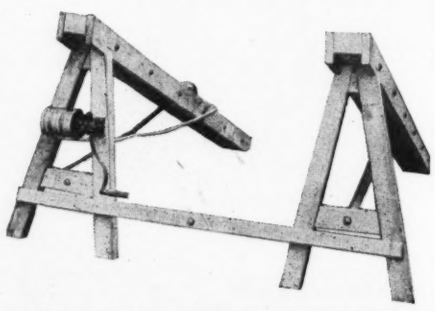
This consists of an electrically operated bell to be mounted on the front of the car for a warning device. It is of pleasing design and said to have a very musical tone. The bell itself is cast of statuary bronze, polished and heavily nickeled. The head, except the special designs, is of spun brass set with polished ruby jewels. Inside is the single coil of enameled wire which actuates the clapper through platinum-silver alloy electrical contacts. All bells are wound and lighted for a 6-volt circuit unless otherwise ordered. A regular bracket is furnished with the bell for fastening it to the radiator neck or to the front of the radiator. The only moving part of the bell is the clapper, which, it is said, cannot get out of order. The bell is made in four models, these being the Red Light, Dome Head, Eagle Head, Ball Head and Shrine Head. Three sizes are made in the different models, the smallest being 3½ by 4½ in., the next 5 by 5 in. and the largest 6 by 6 in. The cheapest type of the Cathedral bell sells for $5.25, while the most expensive model, the Red Light Dome Head measuring 6 by 6 in., is $10.75. The Cathedral Bell Mfg. Co., Baltimore, Md.



New cathedral bell with red light dome head. On the right, Wayne curb oil pump

U. S. Electric Grinding Motor

A new self-contained grinding and buffing motor for garages and tire vulcanizers has been announced by the U. S. Electrical Mfg. Co., Los Angeles, Cal. It can be run from a single, double or 3-phase alternating-current, of from 110 to 440 volts. It is built in sizes of from ½ to 1 hp. and turns from 1800 to 3600 r.p.m. The entire motor is inclosed and its ball bearings are mounted in special housings with sealing rings that keep out dirt and grit. These bearings are standard in size and readily removable for replacement in event of wear. Spindles are of heavy one-piece construction and the convenient tool grind-



George auto incline, making bottom of car accessible

Cork insert fan belt said to eliminate slip

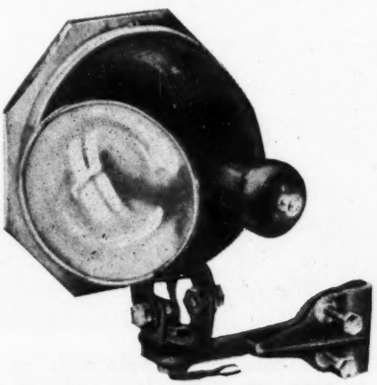
ing rests are adjustable in any direction. The flanges are ample and turned true on all sides to insure proper balance and the wheels running true. The water pot can be swung under the table, out of the way. These outfits are sold motor only for bench mounting; motor with pedestal; or with pedestal, guards, tool rests, water bucket, etc. The floor space of the pedestal is 14 by 18 in. and the height to center of spindle is 38 in. The diameter of the arbor at the wheels is ¾ in.

Kilborn-Sauer Spotlight

Various types of spot lights are being marketed by the Kilborn-Sauer Co., Fairfield, Conn. The illustration shows the 112-M model which sells for $9. The different models can be had either with or without the diminishing mirror, the latter being 4 in. in diameter. All the lamps are one-piece construction and have the patented swivel bracket which allows the lights to be turned into any direction without binding or chafing the wires. The switch, of the push and pull type, is located in the handle. Reflectors are heavily silver-plated and 21 cp. nitrogen bulbs are fitted. The sizes are from 6 to 8 in. and the prices range from $6 to $10.

Cork Insert Fan Belt

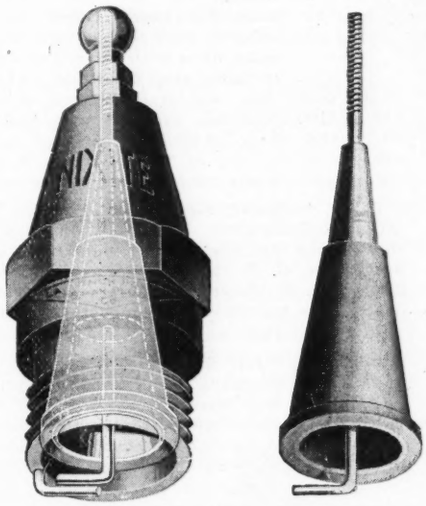
The Advance Automobile Accessories Corp., Chicago, announces a new Ford fan belt. This belt is based on the same idea as underlies cork insert transmission linings for Fords. Circular pieces of cork are inserted into high grade tanned and stretched strips of waterproofed oak leather. The corks are backed up by heavy fabric and cannot become loose or slip out, it is said. Cork insert fan belts reclaim lost motion and make the fan turn with the motor. The slip is eliminated because the corks are not affected by water, oil, grease or dirt. Cork retains it gripping qualities indefinitely and wears very slowly, so that its use results in a fan belt not only of increased efficiency, but of greatly prolonged life, it is claimed. Cork Insert Fan Belts for the 1917 model of the Ford retail for $1, and for other models, 85 cts.



One of the Kilborn-Sauer spotlights

The George Auto Incline

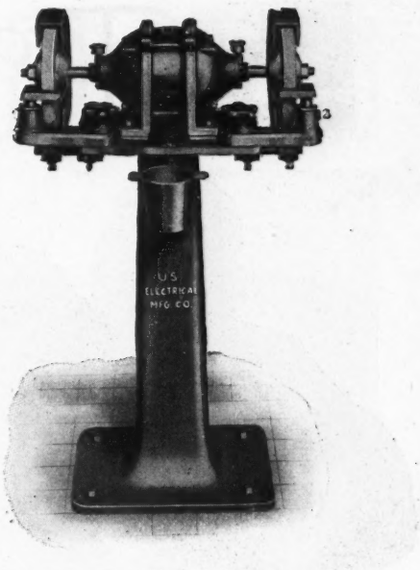
This is a piece of apparatus designed to lift a car from the floor in such a manner that the entire bottom of the chassis will be easily accessible. It is fitted with a windlass and ½ in. hard plaited cord to pull the car up the incline. The car fastens automatically in place at the top of the incline, whereupon the center block of the hoisting apparatus is unhooked and placed under the rear axle, leaving the space directly under the car entirely free. The supports are strong enough to hold cars up to 5000 lbs. The entire length of the device is 10 ft. and the weight about 80 lbs. One man can operate the lifter, which, when not in use, requires very little space. All braces are of 1½ in. angle iron, while the pawl and ratchet are set upon a malleable iron crank. The price is $42.50. Garage Equipment Co., Chicago.



La French spark plug, with cone-shaped insulator

La French Spark Plug

The La French Spark Plug Co., Dayton, Ohio, is placing on the market a new form of plug designed on the principle of the dynamo, so arranged to take the current with the least possible resistance, it is said. Such difficulties as broken porcelains and lost compression due to leakage of the plugs are said to have been overcome by the use of this plug, which is fitted with what is called a Nix-Ite insulator. The latter is cone-shaped and inserted inside of an independent shell of steel. The La French plug is especially adapted for use on high-compression engines and airplanes. The price is $1.



U. S. Grinding motor mounted on pedestal

Hobart Stock Bin

An accessory and parts stock-bin for a convenient and economical equipment for handling stocks of valves, valve springs, bolts, piston rings, bearings, bearing cones, grease cups, etc., has been brought out by Hobart Brothers Co., Troy, Ohio. It contains one hundred and twenty compartments 6 by 8 by 10 in., which will care for practically all of the ordinary sizes of accessories and small parts around a garage. The front partition and ends of the bin are oak, with a light grained finish. The back is of sheet steel. Each compartment bears a metal card holder for indexing its contents. It makes an attractive serviceable and economical equipment. Price $25.50.

Pickett Puncture-Proof Tire

The Pickett Puncture Proof Tire Co., Chicago, has put on the market the Pickett Puncture Proof Tire. The tire is a departure from those in use and the Ford size sells for $30. The tire consists of an outer and inner casing and a demountable rim. The outer casing consists of a rubber tread, then a solid rubber lining, and an inner fabric of five plys of $\frac{1}{16}$-in. rubber lining. The inner casing or tube consists of $\frac{3}{8}$-in. rubber face, four plys of fabric and $\frac{1}{16}$-in. rubber lining. These are put on with a steel rim band which is air tight after inflation. It is claimed that blowouts are practically impossible and that punctures seal themselves by reason of the several linings. The inner casing, it is said, will last from 5 to 10 years if not given road wear but that should the outer casing wear out or be torn, the inner casing will run about 1000 mi. on the read.

From the Four Winds

Smiling Ralph Mulford may not be vain but he is seen here showing Ralph Jr. a race story in MOTOR AGE in which Ralph Sr. was the first to be flagged

CITY Raises Gasoline Storage Limit—The common council of Indianapolis has amended the city building code to provide that 1500 gal. instead of 300 gal. of gasoline may be stored in tanks under buildings.

Delaware Studies Highway Situation—That Delaware may get the best results from the act passed by the Legislature last winter creating a state highway department, the commission had its chief engineer, Charles M. Upham, and its secretary, George Francis, make a tour of Pennsylvania, New Jersey and New York to study the systems of road reports and traffic tabulation in vogue in those commonwealths.

Motor School at Peoria Opens—The Bradley Polytechnic Institute of Peoria, Ill., has opened a summer school for instruction in motor car operation, repair, etc. The course will include electric, starting, lighting, and ignition system and engine work. Owners who wish to learn the care and maintenance are permitted to bring in their cars for overhauling. D. C. Fleming has been engaged as instructor, and the class meets 3 hrs. daily. Several hundred have enrolled.

Boost Black and Yellow Trail—Boosters of the Black and Yellow Trail through South Dakota held a meeting at Brookings June 29. The purpose of the meeting was to complete the county organization. The city commissioners of Pierre have granted a park for tourists on the trail. The park is supplied with water and other necessities for camping parties. The total mileage of the trail through the state is about 500 miles.

Dallas Planning for Show—Despite war conditions, every indication is that the Southwest will see its greatest motor show during the Texas state fair October 13-28. Already more dealers than ever before have filed for space, and drawings will be made soon. The old implement building at Dallas has been converted into a motor car building, and the exposition will be held there. More than 100,000 sq. ft. of space already has been taken. Plans also are being considered for a used car show, but the details have not been worked out.

One-Armed Athlete Shifts Gears with Foot—Homer L. Heath, one-armed athlete of the University of Michigan, now manager of the University of Michigan Union, is called on to do a good deal of driving in that capacity. He uses a Liberty and shifts gears with his foot, starting the car in second gear and then shifting to high speed.

Mexico City Launches American Buses—The first motor bus for use in Merida, Yucatan, arrived recently from the United States and has been put in operation. The city of Merida is well adapted to the bus, as it has about 14 miles of excellent pavement.

Ontario Has 55,000 Miles of Roads—The Province of Ontario has approximately 55,000 miles of road. More than 43,000 miles have been terated and are in fairly good condition. About 20,000 miles are well-graded earth roads; about 3,000 miles are surfaced with broken stone and about 19,000 are surfaced with gravel. In the city of Toronto there is one motor car to every twenty-five inhabitants.

Texas Highway Association Forms—The Dallas-to-Texarkana Highway Association was formed last week with the following officers: Dr. C. E. Cantrell, Greenville, president; Sam R. Greer, Pittsburgh, vice-president. The highway will connect at Dallas with the El Paso and Amarillo highway

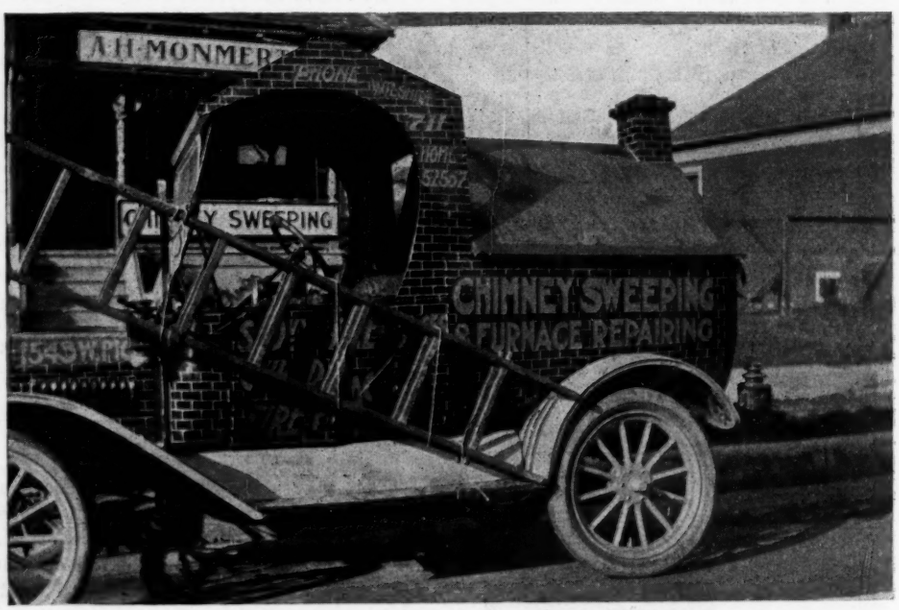
Would Fly After Sinners—The Rev. J. E. Naylor, field evangelist for a Kansas Baptist organization, has offered his services to C. V. Cessna, the aviator who is building airplanes at the Jones Motor Car Co. plant in Wichita, Kan., as a flier, with this proposition: The aviator is to furnish a four-passenger airplane, fully equipped for use in traveling between towns where the evangelist holds meetings. In return the evangelist says the advertising resulting from such trips will make Wichita a household term as the home of airplanes and will likewise cause Mr. Cessna to become more widely known. The evangelist further offers to write an 18,000-word book on "The Sunflower State from the Deck of the Airship 'Kansas.'"

Chicago Motor Club Runs—A series of cross-country runs will be inaugurated by the Chicago Motor Club. The first of these runs will be to Forest Beach, Mich., started from the club headquarters July 15, at 8:30. The runs will be continued every Sunday throughout the summer and will begin at the same hour.

Allen Distributors Meet—Eighty distributors from nearly every large city in the country met at the Allen Motor Co., Fostoria, Ohio, recently for the annual instructions. They also visited the Bucyrus engine plant. The party was also taken in special cars to Middle Bass Island, Lake Erie, where several days were spent. All the distributors reported an increased demand for cars.

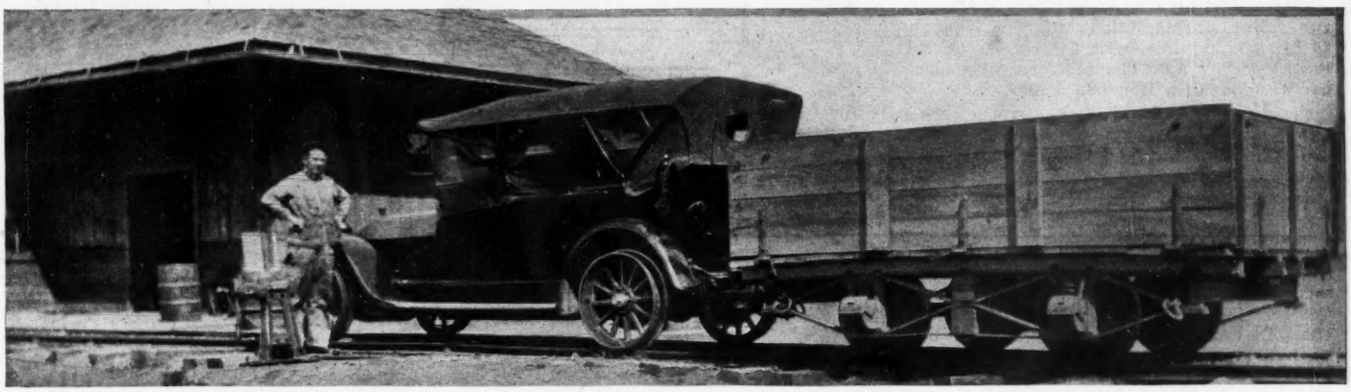
Convict Built Trucks Cease—No more motor trucks will be built for the present at the Ohio penitentiary. H. S. Riddle, of the board of administration, declared that it was practically impossible to get the various parts needed for the machines and that if any more are needed by the state they would be purchased ready for use. Prisoners at the penitentiary have made more than a dozen heavy trucks during the last two years.

Predicts Gasoline Shortage—E. C. Lufkin, president of the Texas Co., believes there will be a serious gasoline and fuel oil shortage this fall, unless the supply is greatly increased in the meantime. The mobilization of troops will create a great demand for gasoline and oil. As soon as ships are available, large quantities undoubtedly will be sent to Europe for the use of United States troops as well as those of the allies.



This Los Angeles car is unique. A house with a chimney has been built on a motor car chassis and the body is painted to represent brick. It is used by a chimney sweep

Among the Makers and Dealers



CHALMERS SIX DOES LOCOMOTIVE'S WORK. A Chalmers Master Six is in regular service as a locomotive for the Warner & Webber Falls Railroad Co. of Oklahoma on this 12-mile railroad between Warner and Webbers Falls. The Chalmers pulls two freight cars over the 2½% grade with loads from 5,000 to 25,000 lbs., three scheduled trips every day and sometimes several extra trips. Carrying these loads, it takes from 30 to 45 min. to cover the 12 miles. It is the regular Chalmers Master Six in all respects except the flanged metal wheels to fit the rails. The car can be converted for road use in 30 minutes. It was driven 20,000 miles before being put in service as a locomotive

ALLEN Succeeds Scott with Puritan—James J. Allen has been appointed purchasing agent of the Puritan Machine Co., succeeding R. W. Scott, who has resigned.

Federal Makes $1,150,000 Contract—The Thompson Auto Co. has contracted with the Federal Motor Truck Co. for $1,150,000 worth of trucks to be delivered during the next six months.

Mason Tire Increases Production.—The Mason Tire & Rubber Co. is operating three 8-hr. shifts in many departments and two 10-hr. shifts in the remaining departments. Production is close to 500 tires a day, which represents the full capacity of the plant. Contracts have been let covering the trebling of the plant during the next few months, and it is expected that production will exceed 1200 tires a day by Jan. 1. Sales are now at the rate of $2,000,000 a year.

Trout Leaves Pullman for Victor—Ralph E. Trout has resigned as director of purchases for the Pullman Motor Car Co., York, Pa., to take a similar position with the Victor Motor Co.

Racine Fire Service Is Motorized—The addition of another American-LaFrance triple hose and chemical motor truck to the equipment of the fire department at Racine, Wis., leaves but one piece of horse-drawn apparatus in this department. Plans are now under way for replacing the last truck with a motor-driven car before the close of the year, and Racine then will be one of the few cities of the country having a completely motorized fire department.

How's This for Tire Service?—R. C. Shumway, who drives a Chandler in Seattle, Wash., reports that the Goodyear cord tires on the rear wheels of his car have given 29,000 miles of service and do not show any signs of going out of commission yet.

To Grow Cotton in Desert—The Goodyear Tire & Rubber Co., Akron, Ohio, has undertaken to convert a vast Arizona desert of 40,000 acres into productive cotton fields. The company already has planted 10,000 acres, and this crop will be harvested in the fall to make tire fabric at the company's cotton mills at Goodyear, Conn.

Reo Sales Show Increase—The Reo Motor Car Co. sales for May, 1917, display an increase over the same month in 1916 of 40 per cent in passenger car and 75 per cent in truck business. The sales department is refusing additional allotments to dealers despite the fact that more than twenty dealers are coming weekly to ask for more vehicles than were contracted.

Racine Rubber Increases—To accommodate the largely increased demands for power because of additions and enlargements of its plant, the Racine Ruboer Co., Racine, Wis., manufacturing Racine Trusty Tread, Country Road and plain tread casings, is undertaking an extensive improvement and enlargement scheme in its steam generating plant. It is said that much additional equipment will be installed and the existing machinery brought strictly up-to-date by replacements where necessary.

Termaat & Monahan May Resume—The affairs of the Termaat & Monahan Co., Oshkosh, Wis., operating a large gas engine and machine tool manufacturing plant, are rapidly being settled and it is expected that operations will be resumed in a short time. The concern was placed in the hands of a receiver last November and has been operating until recently to fill old contracts. The reorganization committee has offered to purchase the assets for $30,000 cash and will assume all encumbrances, and this offer will be heard in circuit court July 16. Preparations already are under way for reopening the works at once under the further direction of

GARFORD TRUCK HAULS LOGS—This Garford truck is in daily service at Enumclaw, Wash., and in this instance is moving a load of 3100 ft. of timber weighting 18,654 lbs. The truck operates 24 hours a day.

the receiver until the new owners actually take charge. The plant is estimated to be worth $350,000 or more.

Kaiser Royal Motors V. P.—L. J. Kaiser has become vice-president and sales manager of the Royal Motors Corp., manufacturer of a 1-ton Ford truck attachment.

Oldsmobile Makes Fast Run—A 930-mile run from Lansing, Mich., to New York in 30 hr. driving time, with 24¾ m.p.h., is the record set by an Oldsmobile recently. The car was that of a Hoboken dealer.

Erickson with American Truck—Fred Erickson has been made chief engineer of the American Motor Truck Co. Mr. Erickson formerly was chief engineer of the United Motor Co. of Grand Rapids, Mich.

Williams to Manage Louisville Ford.—Claiborne S. Williams is the new manager of the Louisville branch of the Ford Motor Co., succeeding Clarence L. Banks. Mr. Williams was for some time assistant manager of the Memphis branch and later had charge of the Nashville office of the Ford Company. He was then transferred to Richmond, Va., where he was manager, and recently was placed in charge of the Louisville branch.

Will Make Adjustable Trailer—The Trailer Truck Co., Nashotah, Wis., has been organized by L. E. Utter and Ralph Howland to manufacture and market a new type of adjustable trailer for haulage of all kinds of materials in connection with either light or heavy duty motor trucks. The carrying body of the Trailer truck is constructed so that it may be extended to carry the longest timbers or poles and is adapted specially for lumber yard use.

U. S. Truck Personnel Changes—Robert S. Stewart, vice-president of the United States Motor Truck Co., Detroit, has been appointed executive officer in general charge of the company. Forest J. Alvin, formerly sales manager, has been appointed general manager and director of sales. These changes were made because President R. C. Stewart of the United States Motor Truck Co. will devote his efforts to the Stewart Iron Works of which the truck company is a subsidiary.

Electric Makes Long Run—That the electric is not alone the ideal city car for a woman but also a man's road car was demonstrated by a run made from Atlantic City to New York under the auspices of the New York Electric Vehicle Association. The run was made in a new model Baker, R & L car. From New York the time was less than 8 hr., no effort being made for a speed record. The run back was in 5 hr. 58 min. actual running time. The mileage was 123½, making the average running time 20½ m.p.h. The car used 283 amp.hr., an average of 2.29 a mile, the cost of which, at a 5-cent kilowatt hour rate, the maximum charging rate in New York, would make the cost $1.55.

New Foundry for Tractor Company—The Killen-Strait Tractor Co., Appleton, Wis., is rushing work on a new foundry building in which it will henceforth manufacture all of the castings required in the making of its machines. Until now the raw castings have been purchased from outside foundries and machined in the Appleton plant. During the last year the company's requirements of castings have more than doubled.

Valve Company Moves to Wisconsin—The Universal Valve Co., Chicago, has moved its general offices to Burlington, Wis., where its products have been manufactured under contract for a number of years by the Burlington Brass Co. The removal is made for the obvious reason that the company wishes to bring its manufacturing and marketing divisions closer together. The Burlington offices are in direct charge of J. B. Knudson, vice-president and treasurer, who has moved from Chicago to that city. The company's specialty is a non-packing valve for high-pressure purposes.

Trader Maker Begins Operations—The William Brummeller Sons' Co. began operations the last week in June in its new factory building where the company manufactures motor car fenders, running boards and other sheet metal parts. Twenty workers are employed.

Goodrich Promotes Johnson—W. A. Johnson, who was assistant manager of the motor car tire sales of the B. F. Goodrich Co., has been promoted to the managership of his department. Mr. Johnson succeeds A. J. Wills, who will be associated with H. C. Miller, director of tires.

Ford-Couzens for Naval Site—The farm in New Jersey owned by Henry Ford and James Couzens has in part been turned over to the United States government for use as a naval militia training station. Work on buildings costing between $500,000 and $1,000,000 has been started.

New Speed Record for Texas—P. W. Gibbs, driving a Maxwell equipped with United States chain tread tires, recently established a new intercity record for Texas. He covered the distance of 300 miles between Dallas and San Antonio in 7 hr. 37 min. at an approximate rate of 40 m.p.h.

MacMullen to Manage Hudson Branch.—B. J. MacMullen of the Hudson factory has been made general manager of the Hudson-Phillips Motor Car Co. of St. Louis, which was taken over by the factory several weeks ago. Mr. MacMullen formerly sold White cars in New York city and later was with Willys-Overland.

Appleton Body Will Build—The Appleton Auto Body Co., Appleton, Wis., organized in February to manufacture a varied line of bodies for passenger and commercial cars, Ford-truck units, etc., has outgrown its plant and is now making preliminary arrangements for the erection of new works during the fall and winter. Details, however, are not yet ready for publication. C. C. Seegar is vice-president and general manager.

Norma Co. Issues Folder—The Norma Co. of America, New York, in consideration of the Washington Convention of the Society of Automotive Engineers, issued a special folder under the title "Norma in the National Service." In very brief paragraphs it refers to the almost universal standardization of magnetos and lighting generators on "Norma" ball bearings in the fields covered by the combined societies—motor cars, trucks and motorcycles; motor boats; airplanes; gas engines and tractors. Without specific reference in the text to wartime conditions, a martial atmosphere is given the folder by the character of the pen-and-ink illustrations.

Coming Motor Events

CONTESTS

July	22—Anaconda, Mont., track race.
July	29—Great Falls, Mont., track race.
Aug.	5—Billings, Mont., track race.
Aug.	17—Flemington, N. J., track race.
Sept.	3—Uniontown, Pa., speedway race.
*Sept.	3—Cincinnati, O., speedway race, championship.
Sept.	6—Red Bank, N. J., track race.
Sept.	8—Hillclimb, Pike's Peak, for stripped stock chassis.
*Sept.	15—Providence, R. I., speedway race, championship.
Sept.	22—Allentown, Pa., track race.
Sept.	28—Trenton, N. J., track race.
*Sept.	29—New York speedway race, championship.
Oct.	6—Danbury, Conn., track race.
Oct.	6—Uniontown, Pa., speedway race.
Oct.	15—Richmond, Va., track race.
*Oct.	13—Chicago speedway race, championship.
Oct.	27—New York speedway race.

*A. A. A. championship award event.

Sept.	12-14—Atlantic City, N. J., motor and accessory manufacturers, mid-season meeting.

SHOWS

Aug.	6-10—Fremont, Neb., general tractor demonstration.
Sept.	2-9—Spokane, Wash., Interstate fair.
Sept.	9-15—Milwaukee show, State Park fair, West Allis.
Oct.	13-28—Dallas, Tex., Dallas Automobile & Accessory Dealers' Assn. State Fair.

Recent Incorporations

Columbus, Ohio — Packard Columbus Motor Co.; capital stock, $100,000; incorporators, Randall H. Mitchell, Edward C. Brisley, R. E. Westfall, N. Bales and Randall M. Mitchell.

Columbus, Ohio — Packard Columbus Motor Co.; capital stock, $100,000; incorporators, Randall M. Mitchell, Edward C. Brisley, Ralph E. Westfall, N. Bales and Randall H. Mitchell.

Detroit, Mich.—Beaver Auto Painting Co.; capital stock, $5,000; incorporators, Alfred Pip, Anthony Bode and Robert W. Anderson.

Detroit, Mich. — Tractor-Truck Sales Co.; capital stock, $10,000; to deal in industrial motor vehicles; incorporators, M. E. Ryan, T. W. Payne and Benjamin Nausing.

Fabius, N. Y.—New Era Double Tire Co.; capital stock, $5,000; to deal in motor cars and tires; incorporators, William W. Kupperman, Harry P. Kupperman and Gerson Rubenstein.

Grand Rapids, Mich.—Service Automobile Co.; capital stock, $10,000; incorporators, Russell A. Bates, Thomas Vander Mey and Harry E. Draa.

Grand Rapids, Mich. — The Samson Trailer Corp.; capital stock, $150,000; to manufacture motor vehicles; incorporators, Edgar T. Towar.

Joplin, Mo.—Joplin Welding Co.; capital stock, $10,000; incorporators, Frank Parks, Charles T. Wyatt and W. R. Andrews.

Kansas City, Mo.—Price-Sanmann Motor Co.; capital stock, $20,000; incorporators, T. P. Price, J. F. Sanmann and P. V. Price.

Milwaukee, Wis.—Lincoln Motor Car; capital stock, $25,000; incorporators, Walter Soerens, Mulkern, H. G. Mulkern and Frank X. Boden. George T. Holtz and George Clark.

Milwaukee, Wis.—Truckmobile Sales Co.; to capital stock, $25,000; incorporators, Frank

Milwaukee, Wis.—Yellow Cab of Milwaukee; deal in motor trucks and attachments for Ford cars; capital stock, $25,000; incorporators, C. H. and Joseph Phillips and Selma Regenfuss.

New York—Hayes Garage; capital stock, $15,000; general garage business; incorporators, Fred L. Hayes, A. G. Kircher and Bernard Steuer.

New York — Audubon Taxicab Co.; capital stock, $5,000; to operate motor cars and taxicabs; incorporators, Marie Prunter, M. H. McMahon and William C. McMahon.

Philadelphia, Pa.—Great American Truck & Tractor Co.; capital stock, $250,000; to manufacture and sell motor cars, trucks and tractors; incorporators, J. Harry Theobald, Egington Franklin and G. King Franklin.

St. Louis, Mo.—Phillips Motor Co.; capital stock, $10,000; incorporators, John H. Phillips, C. F. Phillips and G. A. Phillips.

Swampscott, Mass.—Oceanside Garage, Inc.; capital stock, $20,000; incorporators, Michael E. Burk, Charles Burk and John N. Mader.

Milwaukee, Wis.—Truckmobile Sales Co. of Milwaukee; capital stock, $25,000; incorporators, Selma Regenfuss, Charles H. and Joseph Phillips.

Stamford, Tex.—Hydro Electro Metallic Battery Co.; capital stock, $20,000; incorporators, C. L. Pittsman, D. L. Humphrey and J. P. Johnson.

Trenton, N. J.—Dural Rubber Co.; capital stock, $200,000; to make airplane tubes and tires and motor car rubber accessories; incorporators, Newton A. K. Bugkee, Frederick F. Katzenbach, Edgar H. Wilson, G. F. Ginlen, James C. Tattersall, H. M. Voorhees, John G. Connor, John E. Gill, William C. Ehrenfeld, S. E. Kaufman, Leon Kaufman, Caleb S. Green and Asher Wilson.

Utica, N. Y.—Williams Steel Wheel & Rim Co.; capital stock, $50,000; to manufacture wheels and motor car parts; incorporators, C. B. and H. D. Williams and C. F. Menge.

Youngstown, Ohio—Dalzell Motor Car; capital stock, $100,000; incorporators, T. Paul Dalzell, H. C. Fox, Samuel Stiles, A. E. McCoy and H. C. Hoffman.